ANCIENT CITIES, SACRED SKIES

COSMIC GEOMETRIES AND CITY PLANNING IN ANCIENT INDIA

Edited by
J. McKim Malville • Lalit M. Gujral

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INDIRA GANDHI NATIONAL CENTRE FOR THE ARTS
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FOREWORD

The volume **Ancient Cities, Sacred Skies : Cosmic Geometries and City Planning in Ancient India**, continues the IGNCA's endeavour to explore the many dimensions of some fundamental concepts such as *Akasa* (space), *Kala* (time), *Akara* (form, calligraphy), and the *Pancha Mahabhutas* (the five primal elements). Now it was time to investigate more closely the relationship of the notions of the cosmos and the actual geometries of urban built form.

A seminar was organised to discuss the theme. Case studies were conducted at different archaeological sites and specific cities. The speculative was juxtaposed with the results obtained through precise measurements and instrumentation. Prof. Kim Malville, who has received international recognition for his work in the fields of solar astronomy, archaeoastronomy and geophysics, was the initiator of the idea and uniquely equipped to guide the field studies and conduct the seminar. We are indebted to Prof. Kim Malville, a distinguished member of the IGNCA's extended family. The essays included the symbolic geometry which helped organise the integrated life of traditional cities. The city is laid out concurrently at many dimensions. It represents the macrocosm of the celestial realms; mesocosm of the natural landscape; and, microcosm of human artifacts and architecture, ritual, texts and popular traditions.

In the Introductory chapter, Prof. Malville observes that "one of the defining admonitions of post-processual archaeology is that in order to be able to understand the meaning of an object within the archaeological record, one needs to know its context as full as possible". He states that space may function as text in which informations are encoded. He emphasises that "our approach is to search for patterns within that space, pattern which may have been actively constructed or simply perceived in surrounding spaces". The goal of research is to understand the spatial environment in time and space dimension.

Other papers in the volume carry forward the theme of the concepts underlying urban planning of ancient cities. Mr. R.S. Bisht's paper is convincing proof of the exquisite planning of the model Harappan city of Dholavira in Kutch district of Gujrat, including its amazing water-management system. Citing some details about fortified urban sites as given in Kautilya's *Arthasastra*, Mr. M.C. Joshi presents a case study of Sisupalgarh, an ancient township located near Bhubaneswar in Orissa. He states that features of planning at an archaeological site can be detected in the extant system of roads, alignment of structures, gates and fortification. A settlement had to be conceived and designed keeping in view the existing contours, water-sheds, and topography of an area selected for the purpose. Thus, knowledge of geometry and its application was a prerequisite for the planners of a settlement, besides familiarity with techniques of construction and capacity to handle the required building material. Similarly, Mr. Krishna Deva in his paper on urban planning in *Vastusastra*, shows how the architectural canons laid down in Kautilya's *Arthasastra* were followed by architects of ancient cities.

Dr. Rana P.B. Singh and Dr. D.P. Dubey focus attention on the sacred geometry of cities of Varanasi and Chitrakuta. Their studies demonstrate clearly how the idea of ancient city had grown in the psychic purview of physico-cultural and economic processes in the dimension of space and time leading to form an ordered territorial organisation. Prof. Malville's thesis that the city has meaning and significance at the macro, mesocosm and micro-levels, the urban geometries do indeed reflect the movement and the position of the stars. The terrestrial space is organised on the basis of a comprehension and awareness of the location and movement of celestial bodies. Coordinates are established between different orders of space and time. This is similar to all that authors in the volumes of *Space* and *Time* had established in the context of city planning (Jensen, *Space*, 1991); Stella Kramrisch in the context of temple (Kramrisch, *Space*, 1991). Finally, Prof. Malville's article "The Cosmic Geometries of Vijayanagara" is a befitting culmination. He presents a vivid account of the transformation of a culturally rich area into one of the major cities of the world — an extra-ordinary story writ large in the stones of the ruined city.

I have no doubt that the volume will evoke a stimulating response from many archaeologists, astronomers and art historians.

I thank the six contributors singly and together. Also, I thank Prof. Malville and my colleague, Dr. Lalit M. Gujral, for editing the book, and the co-publisher, Aryan Books International, for seeing the book through the press.

August 4, 1999

Kapila Vatsyayan

PREFACE

This volume is based on papers presented in a one-day Seminar **The City and the Stars : Cosmic Urban Geometries of India**, organised by the Indira Gandhi National Centre for the Arts on April 14, 1994, at New Delhi. The theme of the Seminar, an entirely novel idea, had been suggested by Professor John McKim Malville.

The seminar explored the symbolic geometry that helped organise the integrated life of past cities. The synthesis of archaeology, astronomy, and cultural geography, a multi-dimensional approach was discussed in the three dimensional context of a culture: macrocosm of the celestial realms; mescosm of the natural landscape; and, microcosm of human artifacts and architecture, rituals, texts, and folk traditions. The Seminar endeavoured to recreate as fully as possible, the symbolic environment of people and their times as evidenced by the structures of their cities.

The Seminar was inaugurated by Dr. Kapila Vatsyayan, Academic Director, IGNCA. A total of seven technical papers were presented. The cities and landscapes described in this volume cover a time span of 4,500 years, from the Harappan city of Dholavira to the capital city of the last great Hindu empire of Vijayanagara. While all, including Sisupalagarh in Orissa and the pilgrim centres of Chitrakut and Kashi, display some degree of planning, geometry, and order, the paper on *Vastusastra* describes the geometrical design of the classic Indian planned city. The Seminar concluded with the analytical remarks of Dr. Kapila Vatsyayan who not only summarised the major issues raised by the papers, but also led a spirited discussion on the need for more holistic thinking in fields related to the topic of the seminar.

We are deeply grateful to Dr. Kapila Vatsyayan who very graciously agreed to publish this volume in the Kalasamalocana Series of the IGNCA.

Lalit M. Gujral

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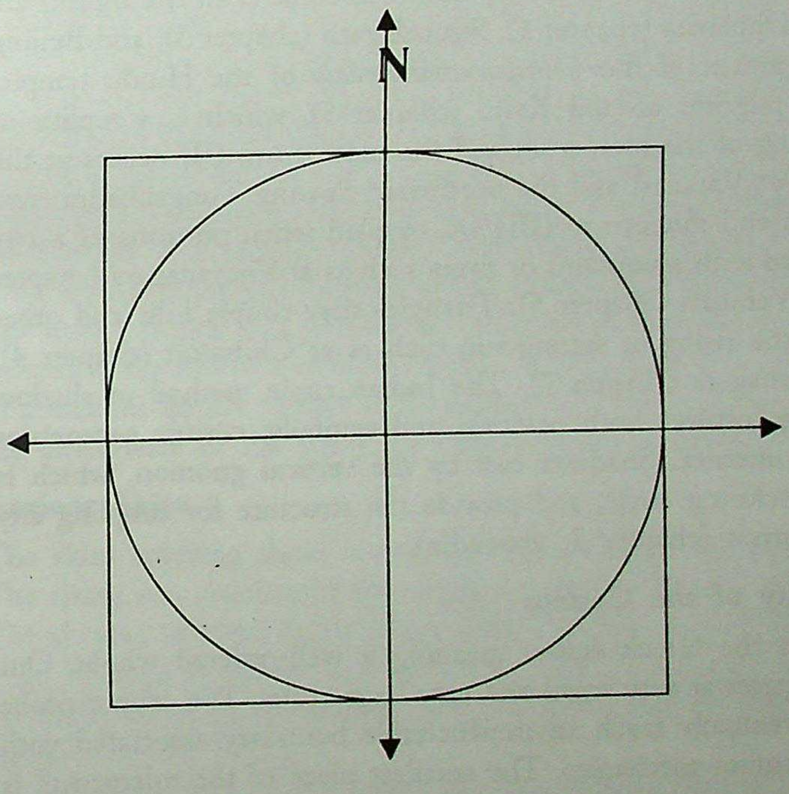
INTRODUCTION

J.M. Malville

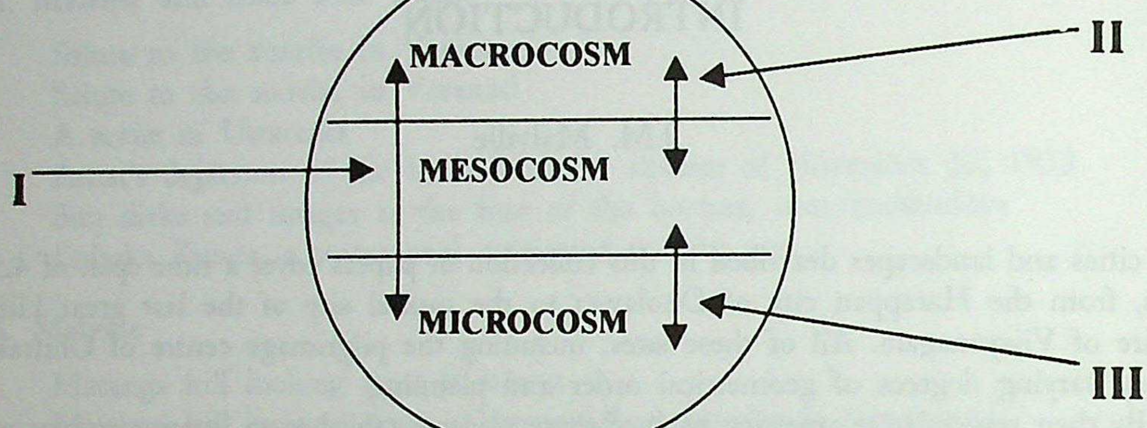
The cities and landscapes described in this collection of papers cover a time span of 4,500 years, from the Harappan city of Dholavira to the capital city of the last great Hindu empire of Vijayanagara. All of these sites, including the pilgrimage centre of Chitrakut, display varying degrees of geometrical order and planning.

By their respective geometries, each of these places establishes an interior cosmos with order and meaning. Geometries utilizing lines, triangles, rectangles, and circles were used to couple interior spaces with those of the larger cosmos. The geometric connection between microcosm and macrocosm that has always been easiest to construct and to interpret is cardinal orthogonality. Space within the city was designed to mimic the geometry of the larger cosmos by constructing a grid work of mutually perpendicular lines aligned to true north. The *mandala*, with its circle, square, and radial symmetries, is another common strategy for connecting interior urban space with the exterior cosmos.



Cosmic geometries, as we are applying them to the urban spaces and ritual landscapes of this volume, are those geometrical figures that interconnect the three realms of the cosmos consisting of

(1) the macrocosm of the north celestial pole, stars, planets, moon and sun;
(2) the mesocosm of the atmosphere, mountains, lakes, oceans, and rivers;
(3) the microcosm of city, temple, home and body.



Specific geometries that couple the macrocosm to the microcosm (I in the figure) are the alignments of cities such as Dholavira (chapter 1), Sisupalagarh (chapter 3), and Beijing to true north, the cardinal alignment of the *vastupurushamandala* of the Hindu temple, and the circular movement of pilgrims around Kashi (chapter 5), which is a replica of the universe. A symbolic coupling of the mesocosm and the macrocosm (II) occurs at the northward flowing Ganga river at Varanasi and the northward flowing Tungabhadra river at Vijayanagara. The mesocosm and microcosm (III) are coupled when portions of a city or pilgrimage mandala are aligned with mountains or rivers such as at Vijayanagara (chapter 7), Chitrakut (chapter 4), and Varanasi (chapter 5). Triangles may couple hills and other features of the landscape with the rising or setting sun such as at Chitrakut (chapter 4), Varanasi (chapter 5) and Vijayanagara (chapter 7). The Indian circle method of shadow casting to determine true north involves both practical and symbolic cosmic geometries and is an exemplar of such geometries. Shadows cast by the vertical gnomon, which is itself an *axis mundi*, cross an enclosing circle, and provide the structure for coupling city and temple to the sun and cosmos (chapter 7, appendix).

The Boundaries and the Unity of the Cosmos

The word 'cosmos' comes from the Greek *kosmos* meaning a well-ordered whole. Our modern cosmos has strict boundaries at very small and very large scales. We cannot probe inward without limit, for we eventually reach an impenetrable boundary associated with the Uncertainty Principle of quantum mechanics. The smallest piece of the microcosm is known as the Planck length, 10^{-32} centimetres. Smaller scales are *absolutely* unknowable due to quantum mechanical chaos in which an ordered sequence of elements of space (such as occurs along a ruler) cannot exist. The large-scale boundary of the universe lies at a far distance of 10^{27} cm, corresponding to 15 million light years. Beyond that edge of the expanding universe, all of space and time is unknown and forever unknowable because space and time beyond the edge would be receding from us at speeds greater than light.

Like the walls of the ancient city, these numbers set the boundaries to our cosmos of today. Within those walls, all space is woven into a single continuous fabric. No isolated islands of energy or matter can exist in our universe, and much of modern physics today is involved in demonstrating the interconnectedness of all of its parts. Newton's concept of Universal Gravity, which tied the falling apple to the orbiting moon, first pointed the way to the unification of the cosmos and thereby established much of the holistic approach of today's physics.

Cities of the Indus

The first systematic application of cosmic geometries in city planning in the ancient world may have occurred in the Indus valley some 4,500 years ago, inspired perhaps by the human urge to live in a cosmos rather than chaos. The orientation of the Harappan sites to the cardinal directions suggests not only the skill of the astronomer but also the apparent intent of an ancient urban planner to interweave, by means of geometry, the microcosm and the macrocosm.

The Harappan cities appeared suddenly: the concept of planned urban space, in all of its complexity, may have evolved in 100 years or less (Parpola 1994; Possehl 1990). In an amazing burst of creative activity, a technique for determining true north was developed; a methodology for surveying geometrical grids was established; construction brick sizes were standardized; writing suddenly appeared; and a system of weights and measures was invented (Possehl 1990). Astonishing amounts of human energy and labour went into the planned construction of these cities. Mohenjo-daro and Harappa covered approximately 1 sq. km each, and by means of their cosmic geometries, some 40,000 inhabitants in each city were brought into parallelism with the cosmos. The citadel of Mohenjo-daro, which covered 400 x 200 m and stood some 7 m high, may have represented the cosmic mountain, in a manner similar to that of the ziggurat. In its Great Bath, rituals may have symbolized the emergence of life from the cosmic ocean (Parpola 1994).

Ancient Skies

The skies covering those ancient cities must have had astonishing powers of persuasion. The rising sun proclaimed the rebirth of days and years, and the moon measured the year. The absence of street lights and pollution produced a sky that was black between the bright stars. Perhaps all heaven and earth were seen as portions of a seamless whole, and at night the horizon may have vanished, eliminating any boundary between the celestial and terrestial realm.

The land of the Indus plain was dominated by its great southward flowing river, moving from the high mountains in the north to the vast sea of the south. Fish swarmed in that river like stars in the sky. According to Parpola's (1995) proposed decipherment of the Indus script, stars and fish may have been homophones, represented by the same fish sign. Fish glittered brightly in the dark river; phosphorescence marked their dartings at night; and the glittering overhead stars may have been fish of a cosmic ocean.

Fixed above the northern mountains was a star that did not move. Today we call that star Thuban, alpha Draconis, which reached 0.6° from the celestial pole in 2780 BC. Following that time, precession of the earth's axis of rotation slowly moved Thuban away from the stillness of the centre and for three millenia no other bright star approached the celestial pole. The star we now know as Polaris has moved near the pole only within the last few centuries. Polaris will never reach as close to the celestial pole as did Thuban some 5,000 years ago.

Away from the pole, stars move across the dome of the sky in ever widening arcs. Some moved faster and more erratically than others; these were the seven "planets" as seen from the earth, Sun, Moon, Mercury, Venus, Mars, Jupiter, and Saturn. The "river" that the planets followed in the skies is the ecliptic, known as the Ganga of the skies, the *akasha ganga*. The Harappans would not have used that term, of course, but may have imagined their own river to be a reflection of that river of the skies. Mercury, perhaps represented as a little green fish in Harappan script, swam quickly along that river, and dim Saturn, dangerous and black, moved slowly along the ecliptic like a turtle (Parpola 1994). Today the ecliptic path, followed by the sun, planets, and the time-keeping moon, is marked by the 28 *nakshatras*. Parpola (1994) suggests that this manner of dividing the path of the moon started with the Harappans.

The pole star, the ecliptic path, and the *nakshatras* of the moon were all ways to measure and order the heavens. For a few centuries, Thuban provided visual evidence for a stationary centre and may have been used to orient structures to absolute north. The spectacular asterism of the Pleiades which rose in the east during this epoch may have been used for establishing the east-west line. Wanzke (1987) has proposed that the rotation of the axes of Mohenjo-daro by 1°–2° clockwise from true cardinality resulted from alignments with the Pleiades and Aldebaran as they set on the western horizon. Parpola (1994) suggests that the traditional Indian method for establishing cardinal directions employing shadow casting by a vertical gnomon upon leveled ground (Yano 1986; chapter 7, appendix) may have been known and used by the Harappans, based upon the common Harappan motif of intersecting circles on painted pottery.

Not only did the Pleiades rise nearly due east at the time of the Harappan culture, but it also rose heliacally, just ahead of the sun, on the morning of spring equinox beginning in year 2240 BC. This "double rising" of the sun, above the horizon and out of the south, may have marked the beginning of the Harappan year. In stories and myths that may possibly have been inspired by Harappan culture, there are many layers of symbolism that attest to this conjunction between the equinoctial dawn and the heliacal rising of the Pleiades (Parpola 1994). Most prominent is that the Pleiades is named after the Krittikas, the wet nurses of six-headed Skanda, who symbolizes the six-seasoned year. Before this date of

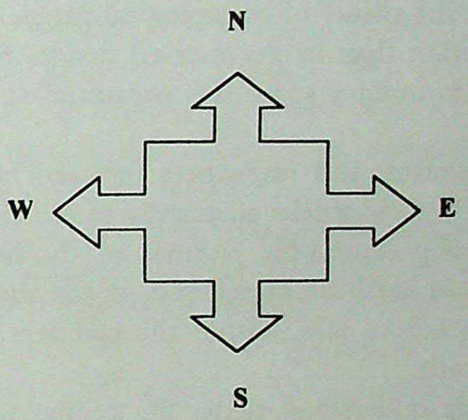
2240 BC, the new year was brought in by the bright, rose-coloured star known both as Aldebaran and Rohini, which first rose heliacally on the spring equinox of 3050 BC during the Early Harappan period.

Dholavira

R.S. Bisht (chapter 1) describes the excavations of Dholavira, one of the largest fortified Harappan cities. The site is on the island of Khadir in the barren salt waste of the Great Rann of Kachchh in the state of Gujarat. It appears to have been a classic Harappan city replete with cosmic geometries: orthogonal cardinality of defensive walls, a cardinal gridwork of houses and streets, a processional north-south roadway, standardized building bricks (9 x 18 x 36 cm), and monumental structures including a citadel or castle. Both the city and castle were rectangles with their long axes east-west. The walls of the city and the castle had the same 5:4 ratio of length and width. Similar to other Harappan cities, water management was a major feature of city planning. At its prime, Dholavira must have been a spectacular "lake city". More than one-third of its total enwalled area of 47 hectares consisted of carefully engineered reservoirs, which may have served both practical and ritual functions, associated perhaps with ancient cosmogonies of primordial waters.

A TYPOLOGY OF ASIAN CITIES

The Cosmic City



Building on Eliade's (1959) ideas about sacred space and Wheatley's (1971) studies of the origins of Asian cities, Jeffrey Meyer in *The Dragons of Tiananmen* has provided an insightful and influential analysis of the characteristics of a "cosmocized sacred city," of which Beijing was the last of a long line in China.

The Shang period (approximately 1700-1100 BC) may have generated the paradigm of the planned Chinese capital. Archaeological material from that period reveals cities at Zhengzhou and Anyang that were squares or rectangles containing individual structures all of which were cardinally aligned. In his summary of studies of Shang capital cities, Meyer (1991) notes the traditional belief that the prosperity and fate of a kingdom depended upon the quality of the geometry of the capital. Meyer (1991: 8) notes that a Shang dynasty ruler who wished to move his capital to a new location, argued that it had been moved five times and successfully took root each time: "As from the stump of a felled tree there are sprouts and shoots, Heaven will perpetuate its decree in our favour in this new city." It did not matter exactly where the city was placed as long as it conformed to the proper geometrical rules.

This theme of the pre-planned cosmic capital was clearly evident and extensively articulated in the Zhou dynasty (1100-221 BC). Texts from the period, in particular the *Zhouli* (Rituals of Zhou), indicated the use of a gnomon, observations of the pole star, and the design of the ideal capital according to rules of cosmic order. There should be nine north-south and nine east-west streets within the city walls which were pierced by three gates on each side. The king's palace was in the centre, lying on a north-south axis which was a major axis of symmetry for the city. The archaeological record from this period confirms the cardinality and axiality of cities, which were mostly squares or rectangles. While this ideal geometry may have never been achieved with perfection during the Zhou period, it apparently had major influence on later Chinese capitals, both inside and beyond the mainland.

The details of the perpetuation of this paradigm through history reveal the strong incentives for each Chinese ruler to construct the same kind of city. The ideal capital was a copy of the heavens and proclaimed the fundamental similarity of macrocosm and microcosm. The capital was built from one mold, designed from one set of cosmic blueprints, and conformed to one prevailing theory of cosmological parallelism. The particular location of the capital was less important than its geometrical design, for it obtained its legitimacy from the manner in which its interior space was organized and not from its place in the world (Meyer 1991: 157).

The parallelism, synchronism, and resonances between heaven and the capital were essential, and Wheatley (1971: 414) speaks eloquently of the "intimate parallelism between the regular and mathematically expressible regimes of the heavens and the biologically determined rhythms of life on earth as manifested in the succession of the seasons, the annual cycles of plant regeneration, and, within the compass of an individual life, birth, growth, procreation, and death."

The Chinese capital was understood to be the centre of the cosmos, lying on the *axis mundi*. At its centre, marked by temple or throne, there was a meeting of heaven and earth (Eliade 1965, 1967). There can be little doubt about the social consequences of such a geometry and the hierarchical nature of such a society. Location of real estate was even more important than it is in the modern city. Access to cosmic power and political influence diminished monotonically with distance from the city's centre.

Meyer (1991) suggests that the geometry of the Chinese capital may apply to many planned cities of the world such as Harappa, Babylon, Ur, Baghdad, Tenochtitlan, Sigiriya, and Angkor, and he develops a detailed model for the "cosmocized sacred city." Such a class of city includes many of the attributes of the cosmic geometries we have been considering: cardinal orientation, axial processional ways, symbolism of centrality, and mapping of the macrocosm upon microcosm. Meyer (199: 149) prefers to use term "sacred" for such as category of city and the term "holy" for the opposite type of city, such as Varanasi, which has acquired meaning because of its unique location and history. Sax (1990) objects to the use of terms such as "sacred space," "sacred geometry" and "sacred landscape" arguing that in India everything and everyone are fundamentally sacred. In particular, Sax considers dichotomies such as that implied in Eliade's (1959) *The Sacred and the Profane* are inappropriate in a culture for which all animate and inanimate elements are derived from a god.

The meaning of order, power, and the north pole in the Chinese capital city may be so specific to the context of imperial China that extrapolation of the model of the Chinese "cosmic" city to other cultures may have limited usefulness. Perhaps a simpler approach, avoiding some of the debate over typology, is to consider the *planned* city, about which Krishna Deva and M.C. Joshi write in chapters 2 and 3, respectively. Both of their discussions provide numerous examples of urban geometries that were linked to the cosmos.

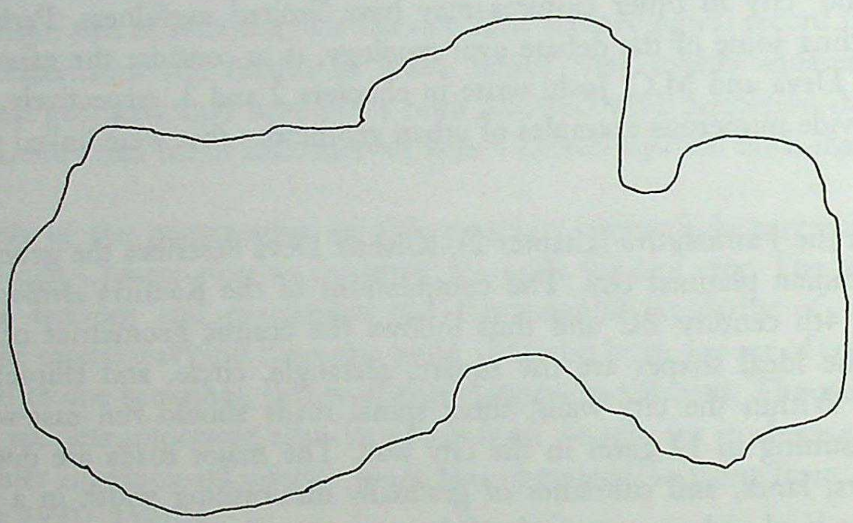
Vastushastra

In his paper on the *Vastushastra* (chapter 2), Krishna Deva describes the geometrical design of the classic Indian planned city. The compilations of the Kautilya *Arthashastra* may be as early as the 4th century BC and thus follows the cosmic geometries of Dholavira by 2,000 years. The ideal shapes are the square, rectangle, circle, and ellipse; triangles are to be avoided. Within the city walls, three spinal roads should run east-west and three north-south, resulting in 12 gates in the city wall. The major roads are divided "at right angles by streets, lanes, and sub-lanes of gradually diminishing width in a grid pattern." The royal palace is placed on one-ninth of the town area north of the centre. For defence, commerce, and convenience of the inhabitants, the city should be founded on the bank of a river or lake which rarely is cardinally aligned. Consequently, many of the old capital cities of India were located on the banks of rivers, such as Patliputra, Ujjain, and Sravasti and the "prescribed shapes of square, rectangular or circular for cities remain just ideals which were rarely achieved." The two excavated city-sites of Vaisali and Sisupalgarh (chapter 3) conform to the shapes recommended by the architectural manuals.

Sisupalgarh

M.C. Joshi (chapter 3) describes the excavations at Sisupalgarh near Bhubaneswar in Orissa which was continuously occupied from about 300 BC to AD 350. Covering an area slightly greater than one square kilometre, Sisupalgarh is a paradigmatic example of the planned Indian city: the cardinally aligned square, a surrounding moat, and two gates on each side. Joshi suggests the initial concept in planning the city was that of "a *vastu-mandala* with a central point that established a circle or rhombus to be turned into square of a vast scale." The space inside the square was divided into 64 grids using the traditional approach of land surveying in the second century BC. The urban gridwork, he suggests, may have had a profoundly cosmological significance. Locations on the grid may have been intended for the gods and the *nakshatras,* which Kramrisch (1980) suggests had been increased in number to 32. The perimetre of the city thereby represents the ecliptic with an entire sequence of lunar mansions. The four cardinal points of the city may have represented the two solstitial and two equinoctial directions. The entire cosmos in its spatial and temporal dimensions was thus contained in the city: the sun orbited the city once a year while the moon orbited it once a month. Joshi concludes that Sisupalgarh was the symbol of "order within a temporal reality stabilized under a cosmic frame." In terms of local history, the fortified city of Sisupalgarh represented the "establishment of an order under a local monarch following the political chaos during post-Asokan times."

The Unplanned City of Local Sacrality



Meyer also developed the characteristics of the opposite type of a city, the unplanned city of local sacrality. Such a place is a highly individualistic urban phenomenon, associated with singular events, unique people, and special places. Its specific location in the landscape is of primary importance, having been located at a special place because of spectacular landscape, a history of pilgrimage, local myths, and traditions. These are places where "non-transferable" and "non-repeatable" events of human history occurred. Their quality is one of "utter specificity" and uniqueness (Meyer 1991: 160), and often they are marked by unusual and dramatic geological features, powerful local traditions, and what Preston (1992) calls "spiritual magnetism." In India, these are *tirthas*, the ancient and modern "crossing-over places" of body and spirit, often historically important fords of rivers. These cities, often pilgrimage centres, have an egalitarian openness, as opposed to the more hierarchical and stratified structure of the cosmic cities. Meyer (1991: 157) argues that because these cities of local sacrality lacked planning by an imperial authority, "there is no recognizable geometry of form, no evidence of overall planning, no relationship to a sacred king, no orientation, or axial way."

Chitrakut

Chitrakut, described by Dubey, Malville and Singh (chapter 4) provides a useful example of the classic *tirtha* and pilgrimage centre. A visit to Chitrakut has been the goal of pilgrims for millennia ever since the time of exile of Rama, Lakshmana, and Sita. The structure of the pilgrimage centre is remarkable for its inclusion of natural topography into a complex geometric network. In addition to the circular *pradakshina* path around Chitrakut hill (Kamadagiri), there are a series of interlocking triangles, established by hills, caves, springs, and pools. These triangles, which are established by features of the natural landscape, are remarkable for their geometric elegance and precision and for their alignments to the sun at solstices. The appearance of such geometrical order in a presumably unplanned pilgrimage center is surprising.

The Hybrid City

Having developed his planned-cosmic/unplanned-local typology of cities so carefully, Meyer (1991: 147) admits that every religiously important city he has investigated contains characteristics of both types. For the emperor and his court at Beijing, the city was clearly cosmic; but from the "perspective of ordinary people, manifestations of local sacrality are more significant." Meyer (1991: 170-171) finally decided that Beijing fits best into the "cosmic" category because it lacked a tradition of normative pilgrimage, i.e. regular visitations by ordinary people in search of meaning.

The cities of Varanasi and Vijayanagara contain geometries that indicate both cosmic and local influences, and both have been destination points for pilgrimage. The cosmic and local dimensions of these cities are not independent and mutually exclusive. For instance, they do not influence different sections of the city, but they are involved in complex interdependent relationships with each other.

In Varanasi, which has been in existence for perhaps three millennia, imperial power had no major influence on its design, although there are definite examples of planning in certain of the pilgrimage circuits. Varanasi (Kashi) is rich with cosmic symbolism and is understood to be a copy of the universe, where Brahma, the lord of creation, was himself born. The eight directions of space and the lords of the seven planets were also reportedly born in the city (Saraswati 1985). When pilgrims circumambulate the city on the *Panchakroshi* circuit, they are symbolically encircling the entire cosmos.

Vijayanagara was established in the early fourteenth century, as the capital city of the largest Hindu empire of medieval India, and the city lasted approximately 250 years until its destruction in AD 1565. Before it was chosen as a symbol of empire by the Vijayanagara kings, the area was a well-known *tirtha* and pilgrimage site. The resulting city combined one of the most dramatic landscapes of the subcontinent, major mytho-historic traditions, and extraordinary imperial power.

Varanasi

In chapter 5, Singh identifies Varanasi as a "ceremonial centre that possesses potent qualities of cosmic orientation without sacred kingship or an intentional foundation ideology." One of the longest continuously occupied cities of the world, Varanasi developed outside of the world of political power and traditional social codes. A pilgrimage to Varanasi is a truly liminal experience, "accessible to everybody, without the sense of affiliation to a caste or outcast." In his extensive documentation of the pilgrimage routes in the city, Singh demonstrates that an elegant and complex cosmogram has been created by the tradition of pilgrimage. Some of the patterns in the landscape are extraordinarily complex such as the spiralling *Antargriha yatra*, the 56 *Vinayakas*, and the directional deities of the Kashi *mandala*. "When and how the sacred geometry of cosmocized structure took shape without support of an imperial power is still an issue to be searched and re-searched."

The spatial organization of the *Adityas* of Varanasi, described by Malville and Singh (chapter 6) provides further evidence of the growth of complex cosmic geometries in a pilgrimage landscape. The geometric pattern that emerges from their study "involves all three scales of the cosmos: the macro-scale of the celestial sphere containing the sun and the north pole, the meso-scale of the Ganga, and the micro-scale of temples, shrines, ritual, text, and people." As is the case with the pilgrimage circuits described by Singh, the shrine of *Madhyameshvara* in the centre of the *Aditya* triangle and the geometric regularities of the triangle provide evidence of intentionality in a largely unplanned city.

Vijayanagara

At the height of its power Vijayanagara (chapter 7) was probably the second largest city in the world, surpassed in population only by Beijing, and today it is the world's largest ruined city. Its design clearly bears the imprint of city planning, proclaiming the significance of kingship. As a showpiece of imperial power, Vijayanagara might have become a classic "cosmic" city in its design, containing those geometric regularities of Chinese and Indian capital cities described by Meyer, Krishna Deva, and Joshi. However, Vijayanagara is not identical to the other "cosmic" cities of the world, lacking overall cardinality and geometrical symmetry. Profoundly unique in both design and location, the city is not a carbon copy of the macrocosm. While Vijayanagara has a precisely articulated north-south axis, many of its features relate exclusively to local traditions and local topography. In the case of this *hybrid* city, the ideal cosmic geometry was overpowered by an extraordinary landscape and by powerful local traditions. As a result, the city became a true *kosmos*, in which few if any of its major features were unconnected or symbolically isolated.

I

URBAN PLANNING AT DHOLAVIRA: A HARAPPAN CITY

R.S. Bisht

The extensive ruins of a settlement were found lying at the village of Dholavira in Kachchh in 1967-68 by Jagat Pati Joshi who declared it to be one of the largest fortified sites of the Harappans in the Indian subcontinent. Subsequently, a systematic area study and documentation of surface features and environs suggested that the site should contain a much larger Harappan settlement, having multiple defences and divisions, and a water harnessing and storage system. The enormity of the deposit indicated considerable antiquity and long occupation. Now, four field seasons of excavation at the site by the Archaeological Survey of India have amply revealed more than what was originally visualized.

An enormous accumulation of successive settlements of over a millennium has revealed seven significant cultural stages documenting the rise and fall of the first Indian urbanization, i.e., the Harappan civilization. In addition, it has brought to light a major as well as a model Harappan city, remarkable for its exquisite planning, monumental structures, aesthetic architecture and an amazing water-management system. It also enjoys the unique distinction of yielding an inscription made up of ten (not of nine as reported earlier) large-sized signs of the Indus script. A variety of funerary structures is yet another feature of exceeding importance which is likely to throw new light on the socio-religious practices and beliefs, thereby indicating a more diverse social mosaic in the Indus population.

Location

Dholavira is a sleepy village ensconced in the north-western area of the island of Khadir, which in turn is strongly isolated by the cheerless and barren salt waste of the Great Rann of Kachchh (Figs. 1 & 2). Administratively, it lies in Taluka Bhachau of the district of Kachchh in Gujarat. Lying to the north of the village, the ancient site is embraced by two monsoon channals, namely, the Manhar in the south and Mansar in the north. Both originate in the low chain of the hills which run along the northern edge of the island. They descend through a short course into the Rann in the west. The ruins, including

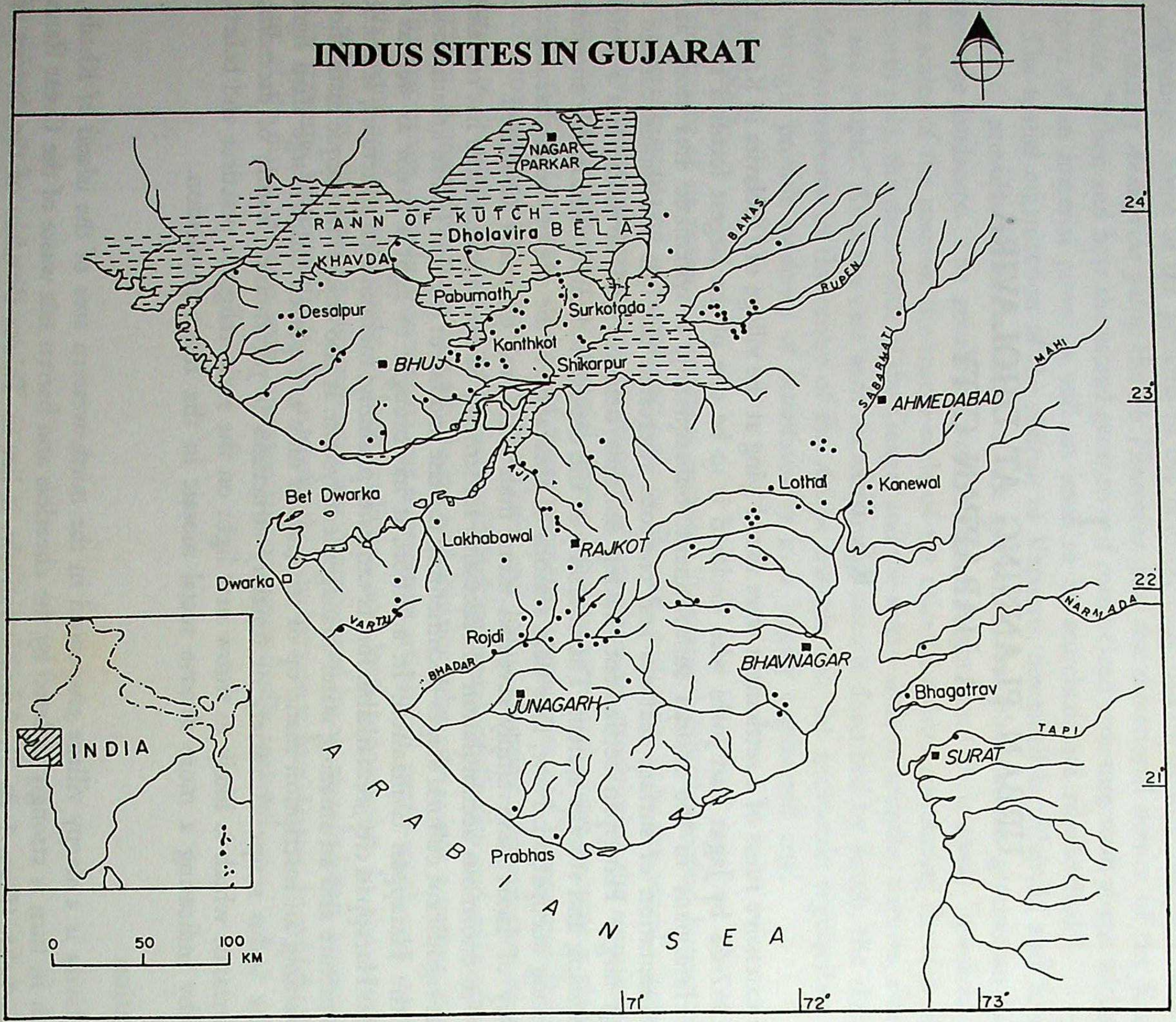
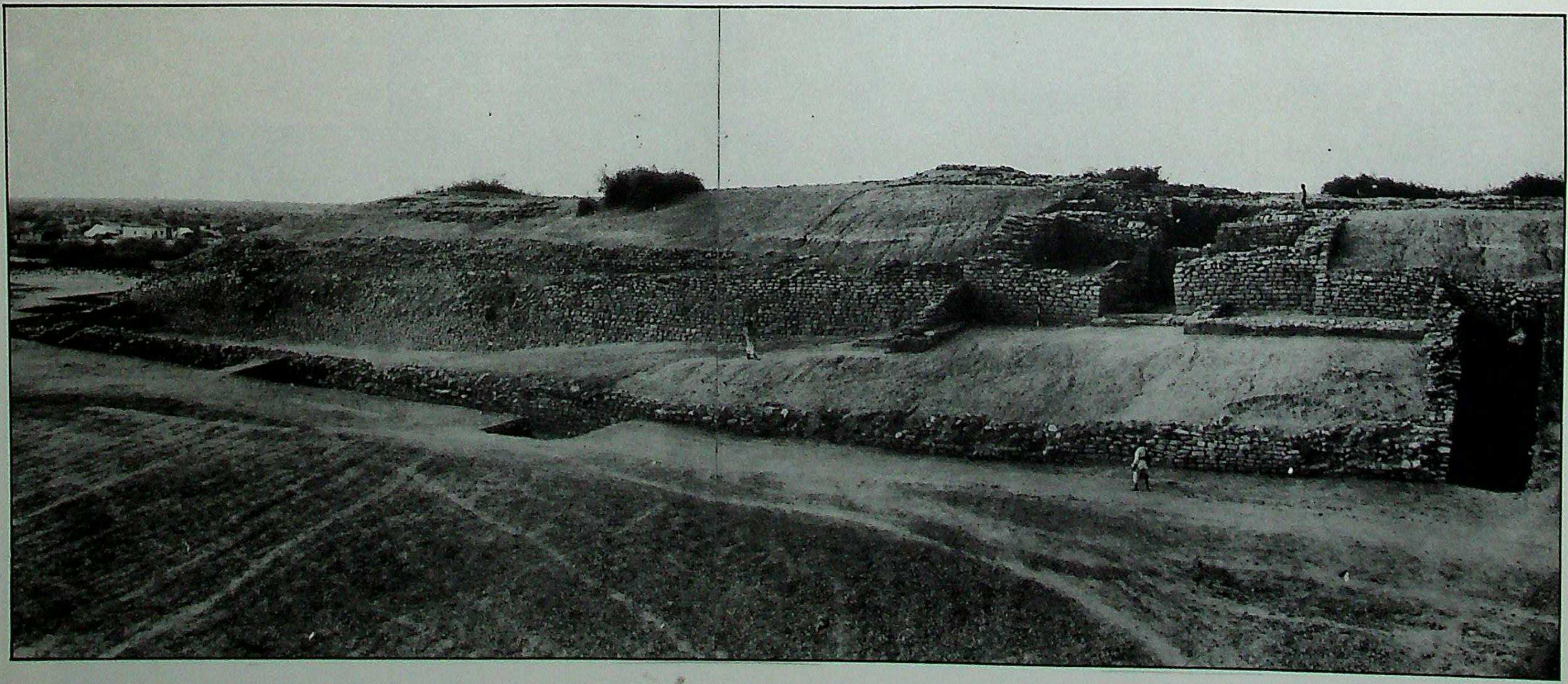
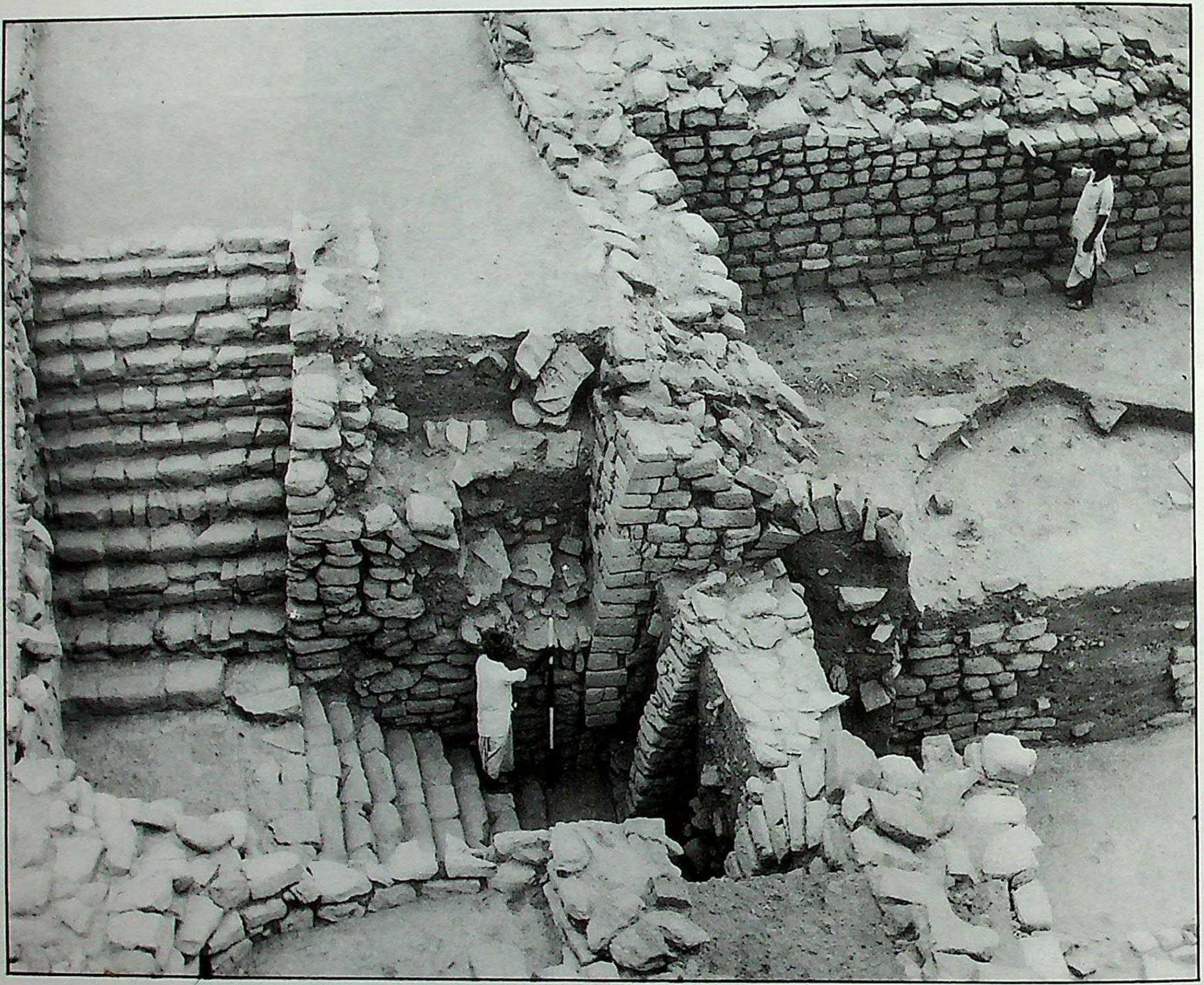

INDUS SITES IN GUJARAT
NAGAR PARKAR
RANN OF KUTCH
BELA
Dholavira
KHAVDA
Pabumath
Surkotada
Desalpur
Kanthkot
BHUJ
Shikarpur
BANAS
RUPEN
SABARMATI
AHMEDABAD
MAHI
Bet Dwarka
AJI
Lothal
Kanewal
Lakhabawal
RAJKOT
Dwarka
VARTU
Rojdi
BHADAR
JUNAGARH
BHAVNAGAR
NARMADA
Bhagatrav
TAPI
SURAT
Prabhas
ARABIAN SEA
INDIA
0
50
100
KM
24°
23°
22°
21°
71°
72°
73°

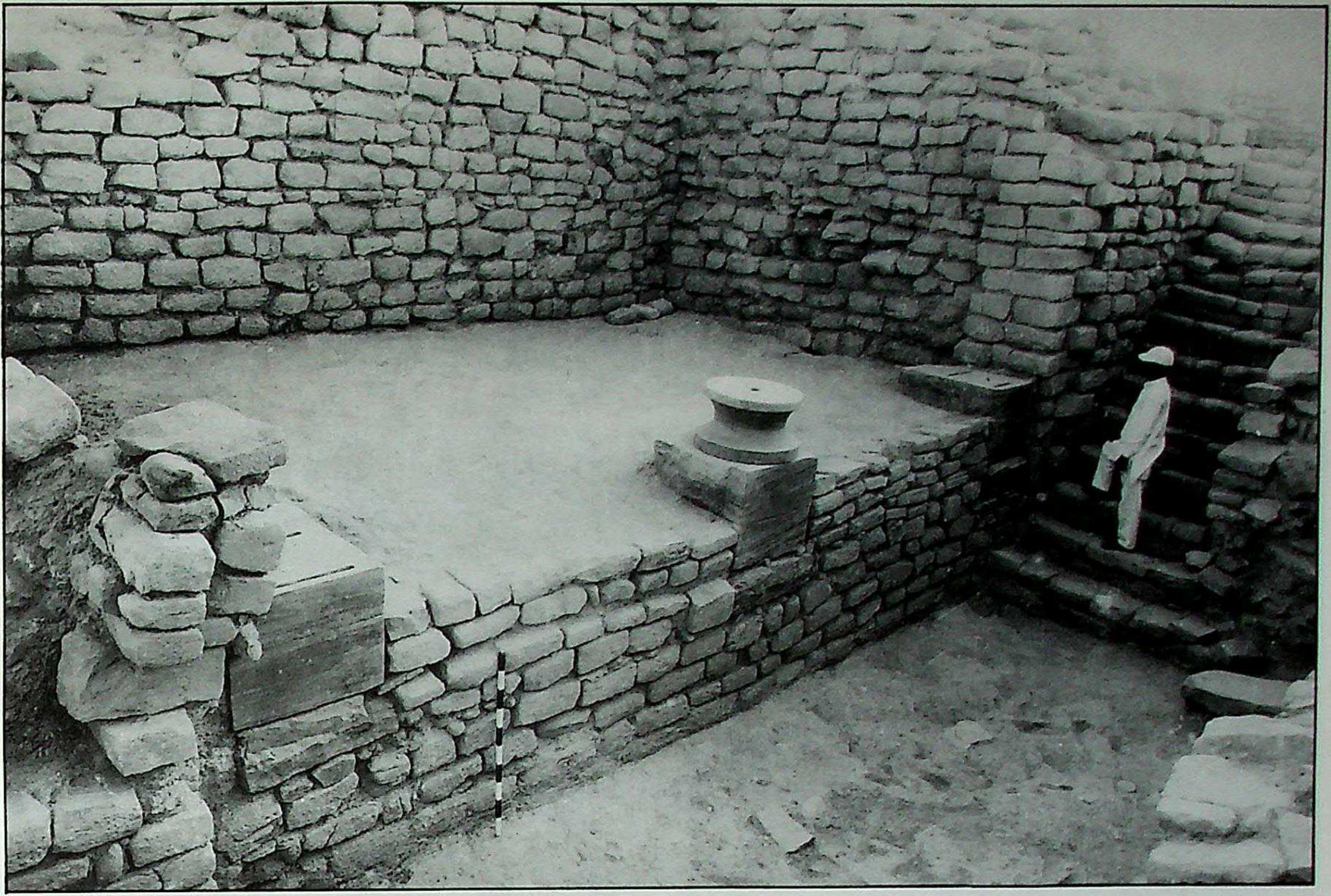
Fig. 1 Indus Sites in Gujarat



Pl. 1.1 Dholavira : castle, 'processional' pathway along fortification wall, leading to front terrace and north gate. Ploughed field is 'ceremonial' ground (*rangabhumi*)

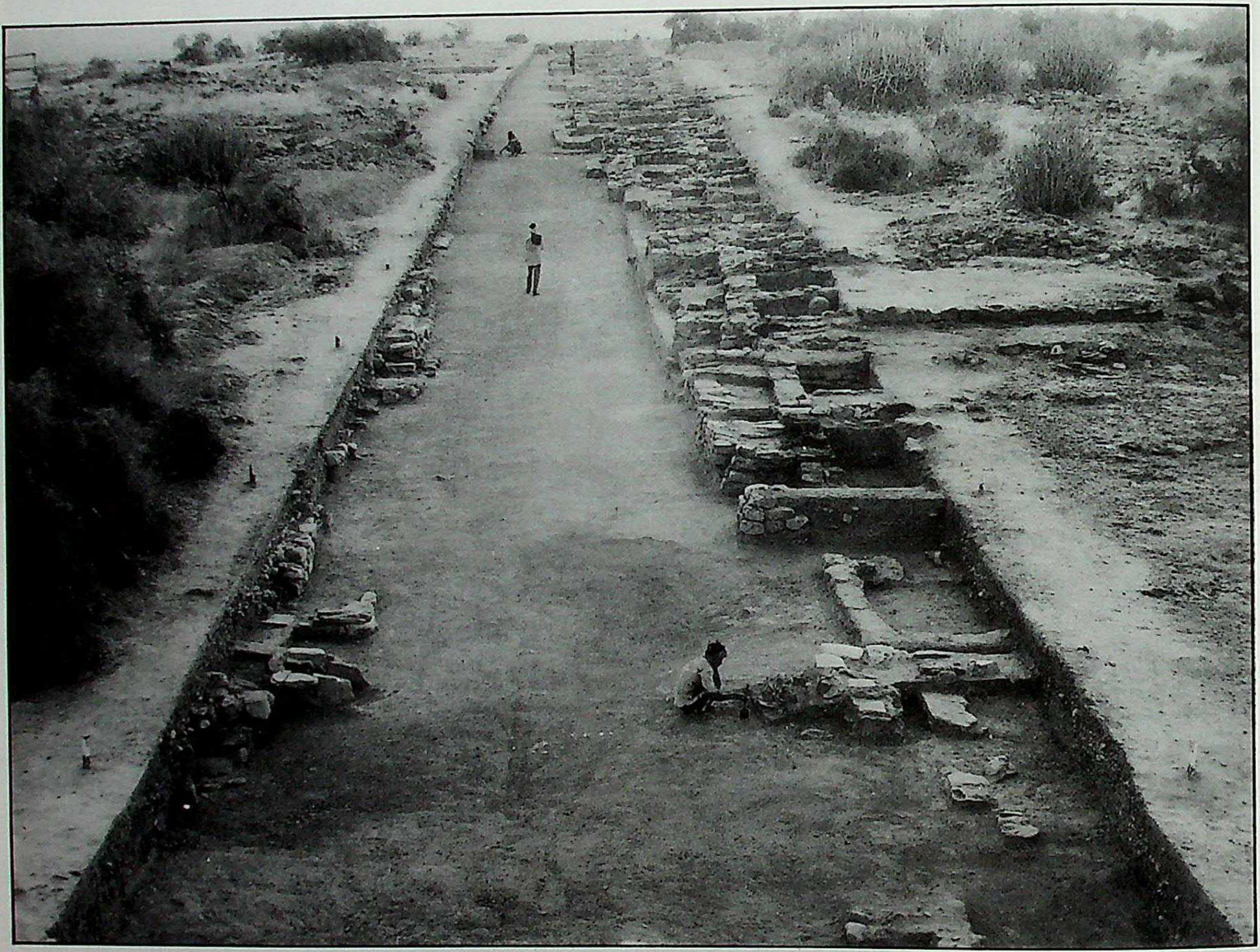


Pl. 1.2 Dholavira : castle, interior of north gate



Pl. 1.3a Dholavira : castle, east gate with a flanking chamber and a sunken passageway. Stone pillar members are seen *in situ.*

Pl. 1.3b Pillar elements made out of limestone in the east gate chamber



Pl. 1.4 Dholavira: middle town, arterial street, running west-east with flanking structures

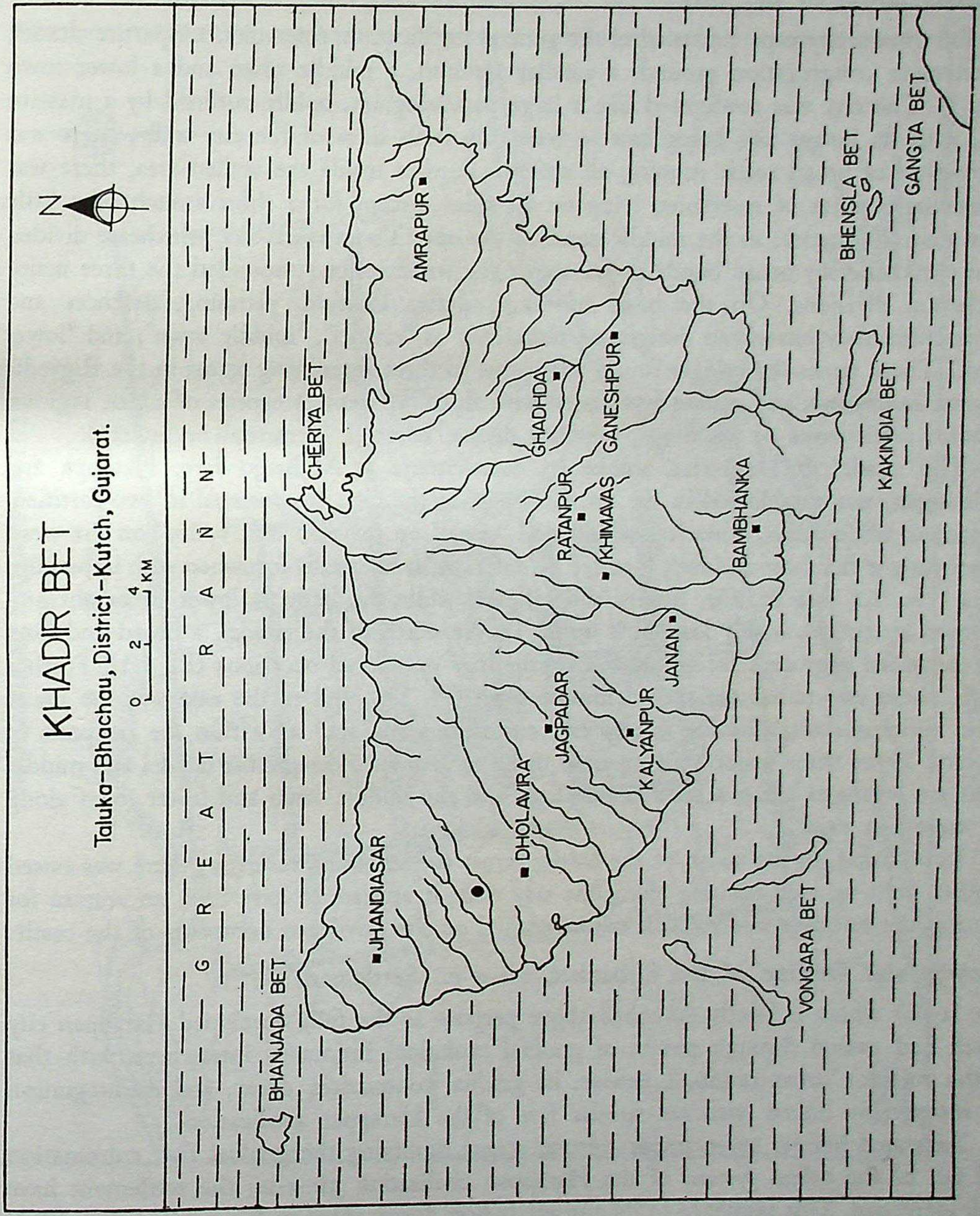

KHADIR BET
Taluka-Bhachau, District-Kutch, Gujarat.
0 2 4 KM
N
G R E A T R A N N
BHANJADA BET
JHANDIASAR
DHOLAVIRA
JAGPADAR
KALYANPUR
JANAN
RATANPUR
KHIMAVAS
GHADHDA
GANESHPUR
BAMBHANKA
CHERIYA BET
AMRAPUR
BHENSLA BET
GANGTA BET
KAKINDIA BET
VONGARA BET

Fig. 2 Khadir Bet

the cemeterey, lie halfway down the slope and are spread over an area of about 100 hectares.

General Layout of the City

The full-grown cityscape consisted of the general fortification, reservoirs, a bipartite citadel, an extensive congregation ground, a smaller stadium, a middle town and a lower town (Fig. 3). The city was configured like a large parallelogram, boldly outlined by a massive wall, with its longer axis being east to west. On both sides of the city-wall , there was a provision of broad roads running all around. Further inside the walled area, there was an extensive series of reservoirs, lying on all sides, except for a short stretch of a little more than 200 metres in the middle zone on the east. Those reservoirs, which are divided from each other by broad bunds raised across the width, once surrounded the three major residential divisions. On the basis of their relative location, planning, defences and architecture, they have been designated tentatively as "citadel", "middle town", and "lower town." These terms temptingly sound analogous to three interesting terms in the Rigveda: *parama, madhyama,* and *avama* (associated with three different categories of zones, regions, stations, settlements or buildings, whether divine, ethereal, terrestrial or human).

The citadel at Dholavira, unlike its counterparts at Mohenjo-daro, Harappa and Kalibangan, was established in the southern part of the city. It consisted of two fortified, conjoined subdivisions, tentatively christened "castle" on the east and "bailey" on the west. The former is the most zealously guarded by defences, aesthetically furnished with impressive gates (Pls. 1.1, 1.2 & 1.3), towers and salients, while the latter is lower in height and enclosed by comparatively less thick walls. To the north of the citadel, a broad and long area provided a ground for community gatherings on special occasions (Pl. 1.1). Further north, there was raised the walled middle town (Pl. 1.4), and to the east was the lower town, which although having no separate enclosure walls, was set within the ramparts of the city. These three major built-up areas make an L-shaped design: the citadel and middle town are arranged along a south-north line, and the middle town and lower town along the west-east axis.

In addition, to the south of the castle, across the adjoining reservoir, there was raised another built-up area running along the city wall. It appears to have been an annexe for housing the retainers and menials who attended on the privileged occupants of the castle.

Growth and Decline of the Urbanism *vis-a-vis* Settlement

The layout which is briefly described above pertains to the fully developed Harappan city which had passed through phases of gradual evolution, intimately interwoven with that of the culture's urbanization. Likewise, its gradual contraction, decay, and disintegration are inseparably linked with the similar fate of the Harappan civilization.

As stated before, seven major cultural stages signifying the gradual rise, culmination and fall of the urban system of the Harappan civilization *vis-a-vis* the settlement have been identified. This sequence in its entirety is best documented in the occupational debris lying stratified in the castle which alone witnessed all the vicissitudes over a period of one and half millenia. The total artificial accumulation works out to about 15 metres out

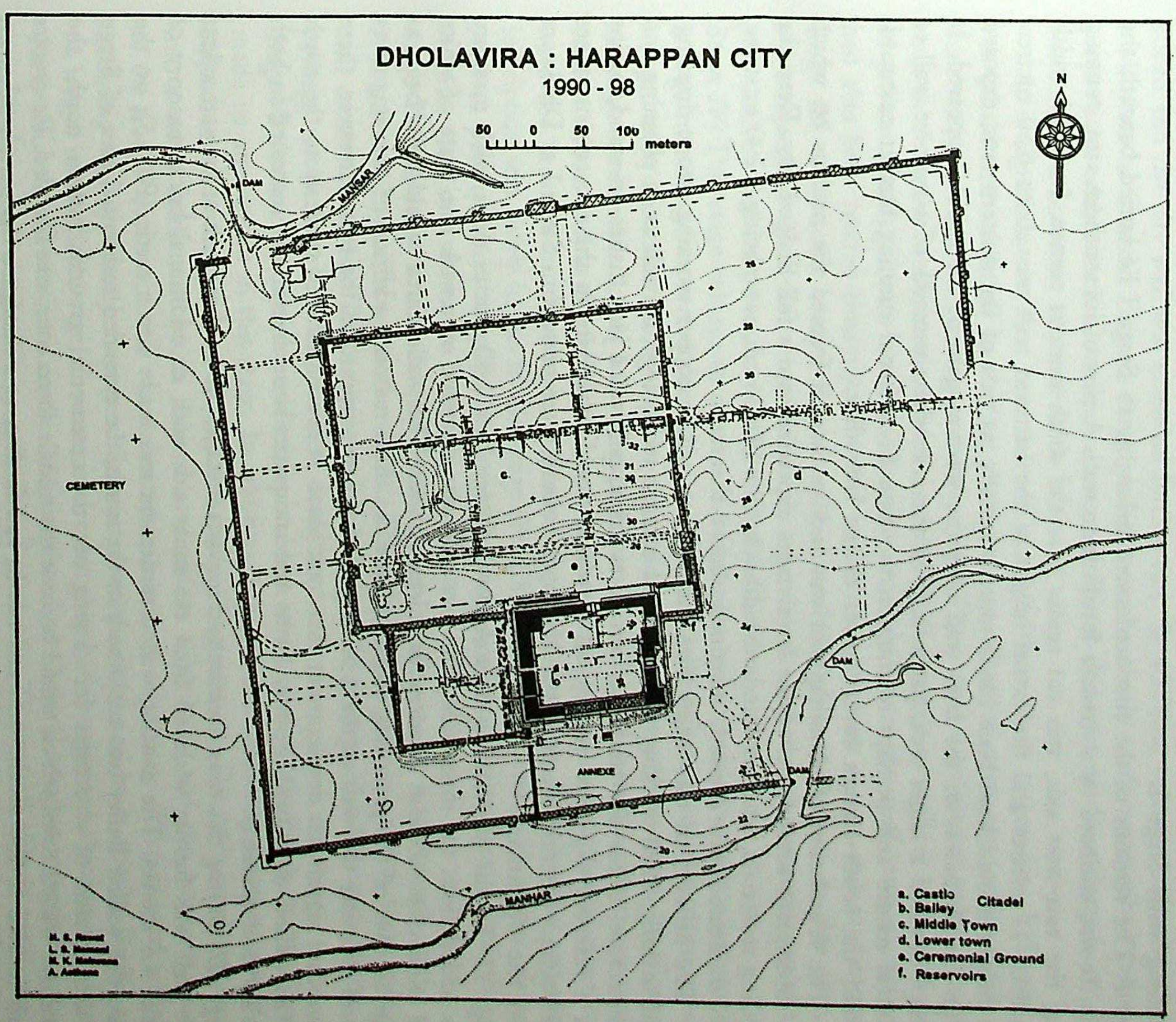

DHOLAVIRA : HARAPPAN CITY
1990 - 98
50 0 50 100 meters
N
DAM
MANHAR
MANSAR
CEMETERY
ANNEXE
a. Castle Citadel
b. Bailey
c. Middle Town
d. Lower town
e. Ceremonial Ground
f. Reservoirs

Fig. 3 Dholavira : Harappan city 1990-98

of which 11.60 metres account for regular occupation, and the remaining goes with the one-time raising of two metres as well as the higher ridges of the extant defensive walls. A brief account of the stages will provide a proper understanding of the entire system beginning with Stage I.

Stage I: The remains of the first settlement belonging to Stage I lie buried beneath the castle. It was enclosed by a massive fortification wall. A part of its southern arm, running along the east-west axis, was cut across near the south-western corner. Its basal width measured 11 metres and the extant height of the battered wall was about 6.50 metres. The height should have been much more originally, as part of the western arm, exposed within the thickness of the later wall near the western gate of the castle, appeared. It perhaps covered a larger area, particularly in the east where remains of a massive wall of identical nature and perhaps orientation too have been found running further eastward, beyond the south-eastern corner tower of the later date.

The foundation of planning that was laid in Stage I formed the nucleus on which the subsequent settlements of the later stages expanded into a full-fledged city. Even the building materials, whether standardized bricks (9 x 18 x 36 cm, ratio being 1:2:4) or stone, both undressed and dressed, remained almost the same.

The artisans of this stage were fully well-versed in copper working, stone-dressing, bead-making, shell-working and advanced ceramic technology, as well as in planning and architecture. Items like triangular terracotta cakes, perforated jars, dishes-on-stand, basins and a reserved slip ware pottery, all of which would proliferate in the subsequent stages and become essential items of the Harappan culture, were present in Stage I at Dholavira from the beginning.

Stage II: To the pre-existing defensive wall (Stage I), a 2.80 metres thick brick masonry was added from the inner side. The face of it was plastered over with fine paste of white and pink clays at least as many as thirteen times. The walled area would have been as large as that of the preceding stage, because the brick masonry addition of this stage was found abutting the wall segment of Stage I that runs outward in the east. However, there is another significant development that took place. A residential area came up to the north of the walled settlement. Pottery forms and antiquities were diverse and increased in both quality and quantity.

Stage III: During this most creative and important stage, the southern arm of the antecedent fort wall was further widened from the inner side with an additional brick masonry of about 4.5 metres. The existing walled settlement was made into a castle (Pl. 1.5); on the west, the walled Bailey was subjoined; in the north, the extended residential area of Stage II was cleared of structures for carving out the ceremonial ground; further north, the extensive walled town which would become the middle town later, was founded. Reservoirs were created to the south, west and north, and farther, at a distance, the peripheral town wall was constructed. For the first time, three steatite seals bearing only figures and no inscriptions appeared besides a potsherd bearing some Indus signs. A cubical weight and a good number of classical Harappan pottery forms and painted motifs made their debut.

Towards the closing years of this stage, the settlement was greatly damaged by a natural catastrophe, possibly by an earthquake of intense magnitude. Its tell-tale marks are distinctly present in the defensive wall of the castle. Repairs were undertaken, the Lower Town was added and the city wall was extended further east. In addition, certain qualitative changes took place as if under dictates for planning so as to obtain certain prescribed ratios and proportions within each as well as amongst different divisions of the enlarged city. This subject shall, however, be dealt with later.

It is significant to note here that, all through those three stages, i.e., I, II and III, the inhabitants exhibited an abiding preference for colourful clays, e.g., white, pink, and their various shades, for plasterings and floorings. Those clays were used in public structures such as defensive walls, roads, streets or ceremonial grounds as well as walls and floors of private houses. In this situation, we may infer that even the roof terraces of houses had also been treated similarly. But this tradition came to an abrupt end at the end of Stage III, as if under a royal decree or by a resolute public consensus. In this case, we are tempted to think that there came about a drastic and almost revolutionary change provoked by political, social or religious turmoil.

Stage IV: This stage belongs to the classical Harappan culture which is widely known from a large number of excavated sites. Almost all of the salient features of city-planning were scrupulously maintained along with its monumental structures such as gates, fortifications, drainage system (Pls. 1.6 & 1.7). Elegant pillars (Pl. 1.3b) and free standing columns were used in this as well as the following stage. It, however, remains inconclusive whether those were the creation of this stage or that of the preceding one. The famous ten-signed inscription was surely in use in this stage (Pl. 1.8). All of the classical Harappan elements such as pottery, seals, weights, beads, items of gold, silver, copper, ivory, shell, faience, steatite, clay and stones are found in abundance.

Stage V: This stage is characterized by the general decline in the maintenance of the city. It is more vividly reflected in the citadel. The other items such as pottery, seals, weights, etc., continued in use. This stage was followed by a temporary abandonment of the site, perhaps not lasting more than a few decades.

Stage VI: A state of transformed Harappan culture, which is so widely distributed in Gujarat, made its appearance in this stage. In addition, new ceramic traditions coming from Sind, Rajasthan, and other parts of Gujarat also made an appearance. The once large city shrank into a small settlement which became confined to the citadel and the southern margin of the middle town where it was delimited by a wall of an entirely different workmanship. Planning was apparently forgotten. Structures were rickety and built poorly. Bricks were no longer in use. Seals were, however, in use, but they had inscriptions alone and no figures. Their shapes always became smaller and simpler. Some cubical weights were still in vogue. In addition, some weights were made out of potsherds. The overall picture projected was that of impoverishment and rapidly crumbling urbanism. Having lived there for about a century, the late Harappans of Stage VI abandoned the settlement.

Stage VII: The desertion that preceded Stage VII was certainly a long one, although, at present, it is not certain how long it lasted. The newcomers were, however using the same pottery wares which their predecessors did. Strangely enough, the new people built their houses in an entirely new circular form. No planning as such is discernible. All of the urban attributes are conspicuous by their absence.

Thus, the urbanization that made its humble beginnings in Stage I and progressed through Stages II, III and IV, started decaying in Stage V. In Stage VI, it found a feeble revival only to become totally deurbanized during Stage VII (Fig. 4). The site was never occupied thereafter.

The Precision of Field Measurements

Final measurements of all the areas as well as important structures were taken by one team, with the same set of instruments and tools, including the measuring tapes, so that the margin of error remained uniform. Tools were simple and ordinary. Furthermore, to the maximum possible extent, in-between measurements of distant or near features were obtained at contemporaneous working levels. Results were cross-checked geometrically with the grid plans. Still a good deal of cross-checking is necessary both on the ground and with the numerous detailed drawings of the collection. Therefore, the measurements will remain subject to correction. If any error, the measurements obtained may be slightly higher than the actual, not less. The margin of error in case of longer distances may at most be 0.2 to 0.5 per cent.

Fortification

Ideally suited for a settlement, well provided with fortifications, built-up areas and artificial reservoirs, the site lies between the storm-channels and halfway down between the hills and the Rann. The site has a few rocky protuberances and ridges, surrounded by a thick pile of naturally deposited sediments. The fortification walls, both inner and outer, were structures of proportionately moulded mud-bricks, successive courses being laid in a recessed manner. As a result, both faces showed a marked taper with receding steps. While the outer faces were normally veneered with rubble and hammer-dressed stones, the inner ones were periodically plastered over with fine clays. At vulnerable places or near the gates, the inner face too was provided with stone-facing.

The outer wall which was constructed in Stage III and remained in use throughout Stages IV and V, and partly during Stage VI, runs, more or less, for a length of 781 metres along the north and 630.50 metres along the west. The southern arm is traceable for a distance of about 600 metres and the eastern for 210 metres, with a vague indication for an additional 100 metres in case of the latter. In the east, the ground being higher and more vulnerable to surface water and wind action, the walls seem to have been eroded totally from the areas where those are missing now. Vandalism of the late Harappans accelerated the process. Thus, in the south-eastern corner, the wall, if it existed, is not traceable now.

Another interesting feature is the provision of projecting salients almost at regular intervals or on either side of gateways. Depending on the presence of vaguely to fairly

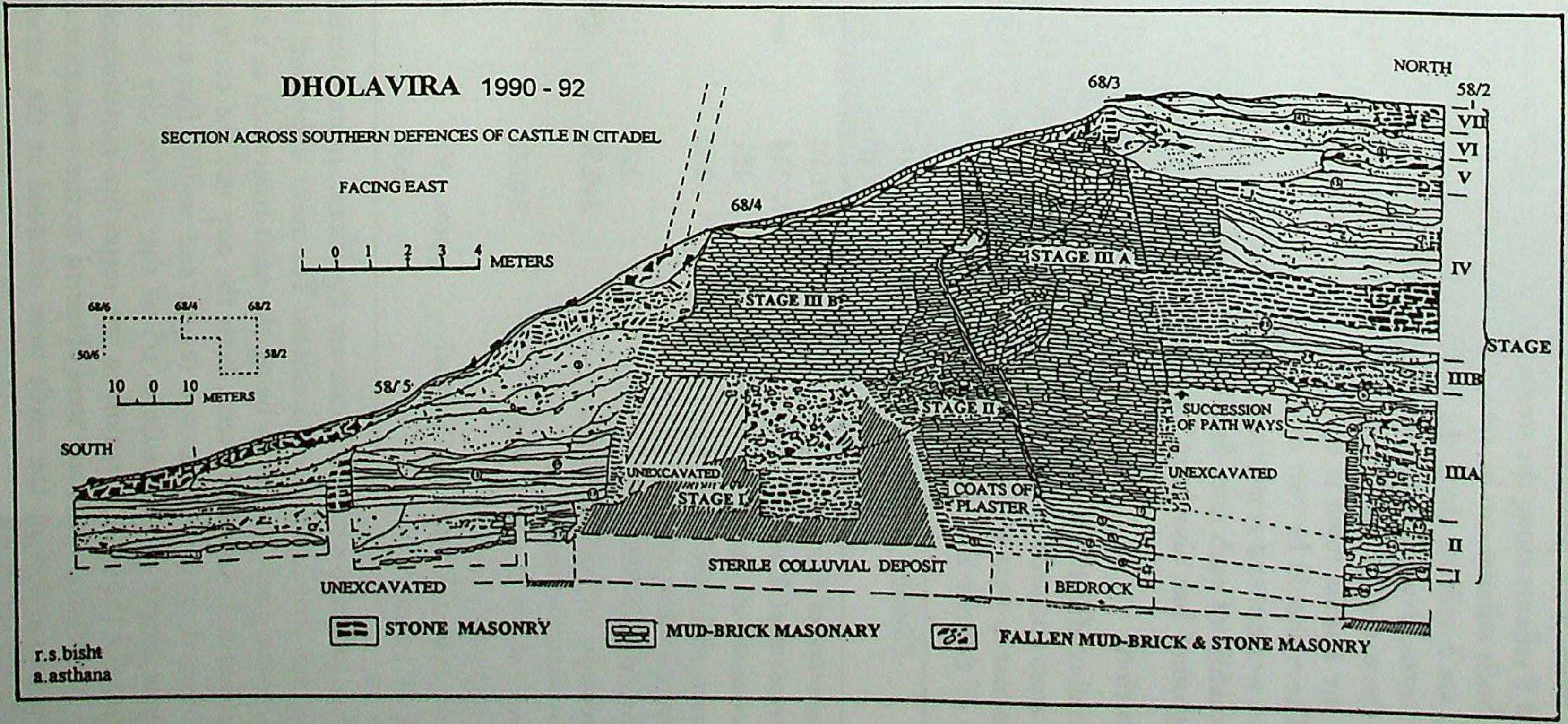

DHOLAVIRA 1990 - 92
SECTION ACROSS SOUTHERN DEFENCES OF CASTLE IN CITADEL
FACING EAST
0 1 2 3 4 METERS
68/6
68/4
68/2
50/6
58/2
10 0 10 METERS
SOUTH
58/5
68/4
68/3
NORTH
58/2
VII
VI
V
IV
STAGE
IIIB
IIIA
II
I
STAGE III A
STAGE III B
STAGE II
STAGE I
UNEXCAVATED
COATS OF PLASTER
SUCCESSION OF PATH WAYS
UNEXCAVATED
STERILE COLLUVIAL DEPOSIT
BEDROCK
UNEXCAVATED
STONE MASONRY
MUD-BRICK MASONARY
FALLEN MUD-BRICK & STONE MASONRY
r.s.bisht
a.asthana

Fig. 4 Dholavira : Section across southern defences of castle in citadel

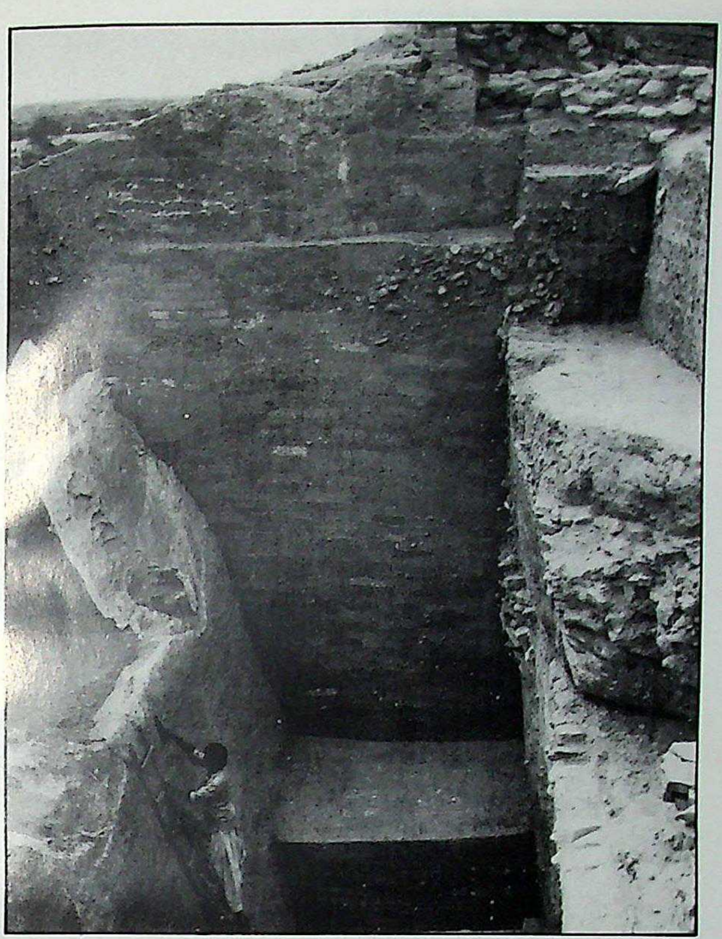
observable remains, there were provided, excluding the corner towers, 11 salients along the northern arm and 9 salients along the western arm of the city-wall, roughly at a distance of 50 to 52 metres. Such salients can be seen along the extant segments of the other arms, too. Likewise, there are 5 salients along the northern arm and 4 salients along the western arm of the middle town. No gateway piercing through the outer walls has so far been exposed, although there are certain prospective points. Of course, one gate provided in the eastern arm of the middle town is laid bare while a few others are strongly suspected in others as well. There should be two more gates, each giving access to the open ground from the eastern and western end respectively. In the castle, an impressive gate was provided somewhere in the middle of each arm. Similarly, one gate giving access to the bailey from the side of open ground has also been exposed.

Ratios and Proportions

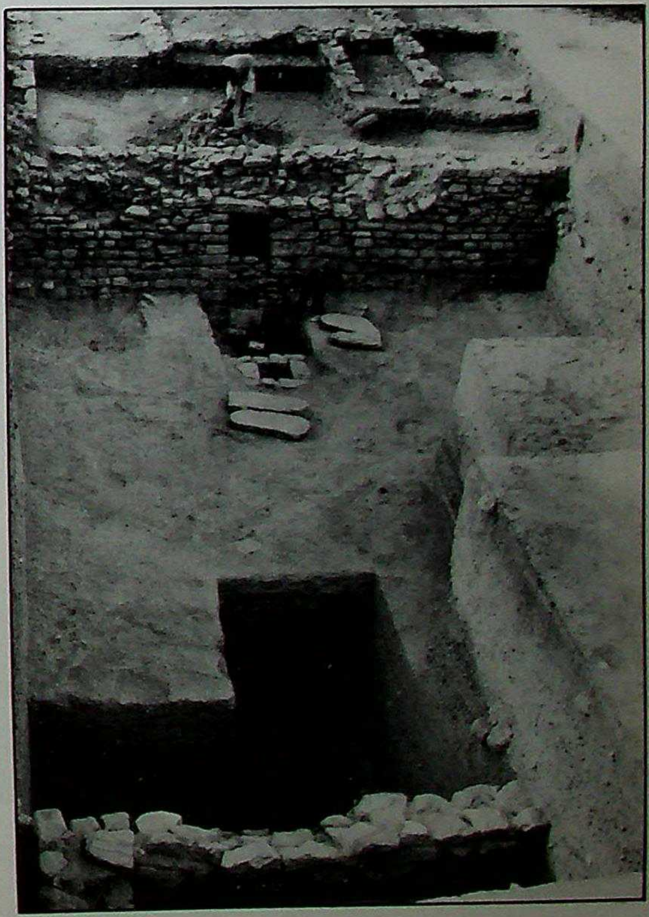
Looking at the overall configuration and supposing that the south-eastern corner was within the walls, the total areas enclosed by the circumvallation (between the inner corners) measure 771.10 metres from east to west and 616.85 metres, giving the precise ratio of 5:4. Similarly, the other divisions of the city also provide quite interesting measurements tabulated below:

Sl. No.	Division	Length metres	Width metres	Ratio
1.	Inner measurements of City	771.10	616.85	5:4
2.	Inner measurements of Castle	ave. 114	ave. 92	5:4
3.	Outer measurements of Castle	151	118	5:4
4.	Total outer area of Citadel (approximately, including bastion)	280	140	2:1
5.	Inner measurements of Bailey	120	120	1:1
6.	Inner measurements of Middle Town (including Ceremonial Ground)	340.50	290.45	7:6
7.	Inner measurements of Middle Town (excluding Ceremonial Ground)	340.50	242	7:5
8.	Inner measurements of Ceremonial Ground	approx. 283	47.50	6:1
9.	Built-up area of Lower Town	330	300	11:10

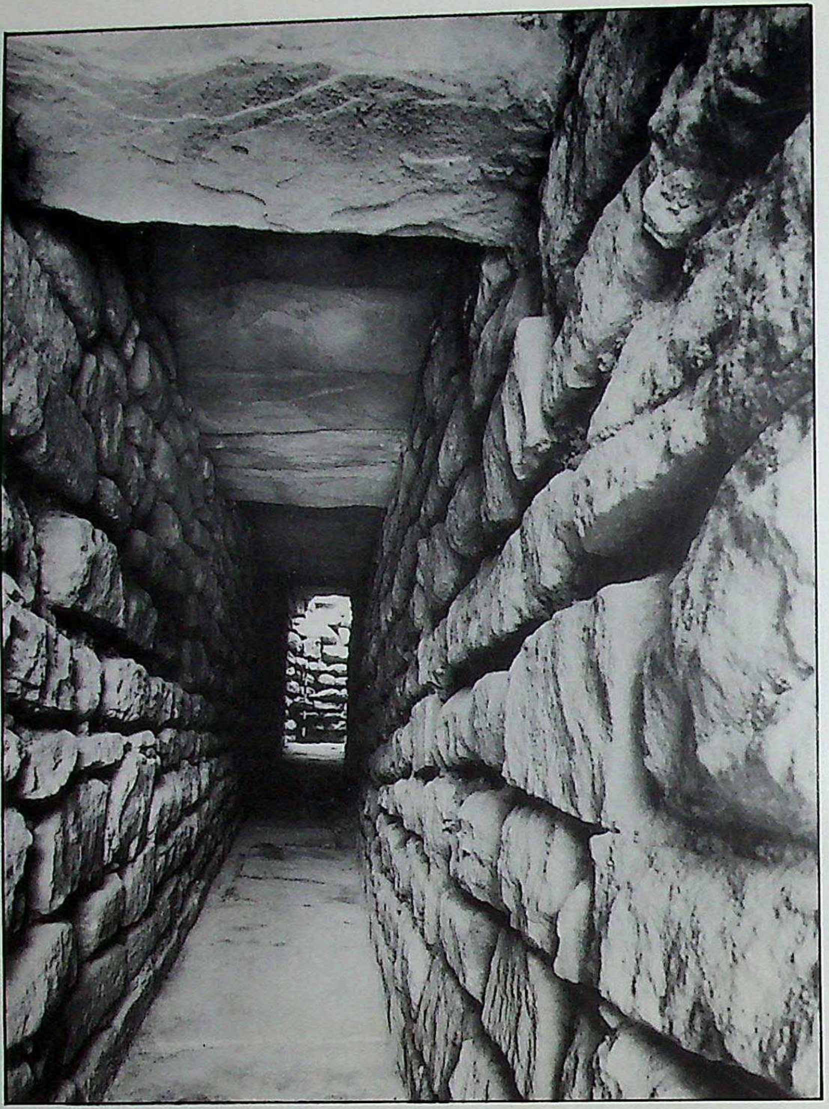
While respective proportions in each case are significant, more interesting is the interrelationship among the divisions and subdivisions. The most important is the relationship between the city and the castle, the latter being the most important as a centre of supreme authority of the settlement. As already seen, both the city and the castle provide the same ratio, i.e., 5:4, in regard to their respective length and width. But a closer examination reveals that the outer length of the castle is 1/5 of that of the city area, while the inner one is 1/7. The same is the case in regard to the respective measurements of the width. The measurements pertaining to the city were obtained on the lowermost contemporaneous level. The inner measurements of the castle were obtained at the extant upper top and



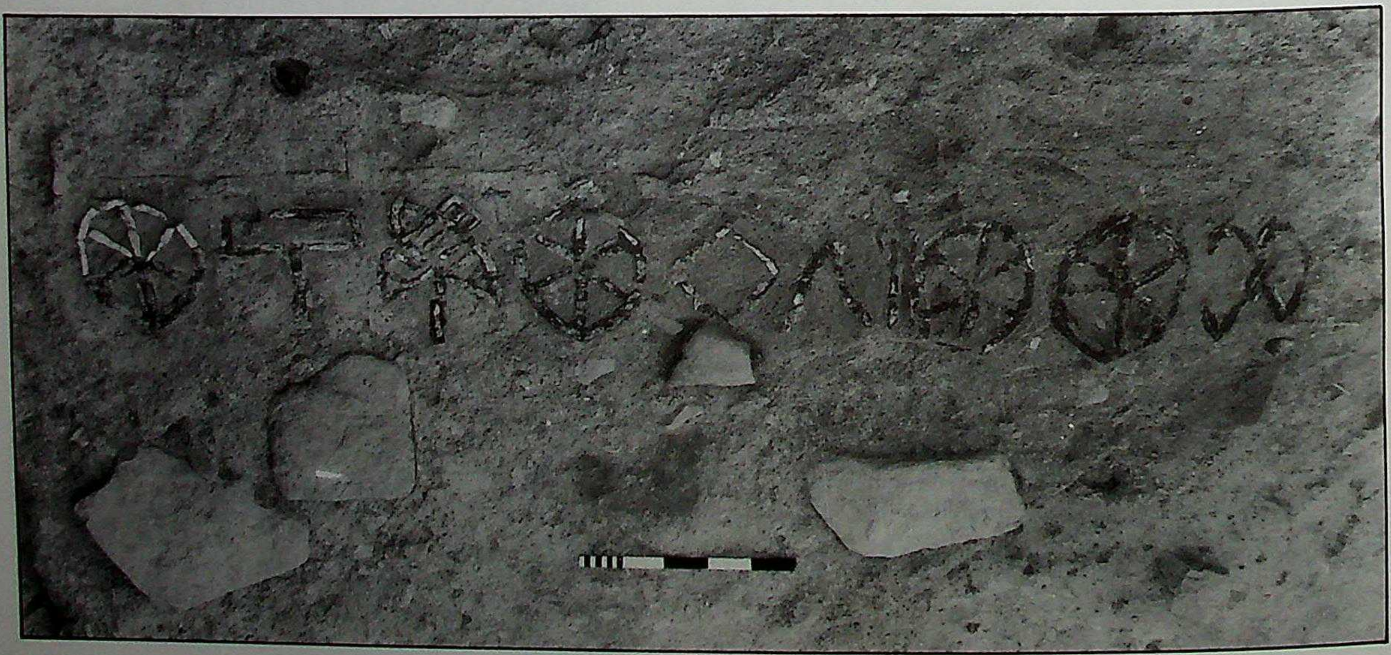
Pl. 1.5 Dholavira : castle, section across the southern arm of defensive wall that showed successive phases of construction



Pl. 1.6 Dholavira : 'castle', an opening of north drain above a steep cascade (not visible) and a covered air-duct



Pl. 1.7 Dholavira : castle, an inner view of north drain for letting off rain water



Pl. 1.8 Dholavira : the inscription of ten large-sized Indus signs found placed in the western chamber of the north gate of castle

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MAL-A

the outer ones at the hitherto exposed levels. In no case has the level of original construction been reached so far.

Further explanation is necessary. The outer area of the castle measures 151 x 118 metres, which ideally should be about 154 x 123 metres. Similarly, the inner measurements should be 110.15 x 88.10 metres. Keeping into account the sharp taper on both faces of the fortification walls as well as the seven to eight metres of thickness of the occupational deposit inside the castle, the measurement in both cases should be what are visualized above. If that is so, as it should be, the ratio of 5:4 is highly significant. In other words, the ratio is 1.25 to 1.00. The latter is an auspicious figure symbolizing increase and prosperity. It is, therefore, presumed that the width was fixed and measured first, followed by the length towards the east—the quarter of the rising sun.

Another noteworthy feature is that the north-western corner of the castle falls on the diagonal drawn from the north-eastern to the south-western corner of the city, while the north-eastern corner of the former falls on the line that is drawn from the north-western corner of the city cutting equally as well through its counterpart of the middle town. This line does not make a diagonal with the assumed south-eastern corner of the city however.

A second noteworthy fact is that the above proportions between the city and the castle were obtained by making alterations in the planning at the time when the lower town was added towards the close of Stage III following the devastating earthquake. Until then, the castle was perhaps larger, extending towards the east where a portion of about 45 to 50 metres was sliced away in order to bring the castle into the desired proportion in relation to the walled area of the city. With the result, the walled area of the castle became the 49th (7 x 7) part of that of the city and the total built-up area of the former 25th (5 x 5) of the city area.

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Coming to the inner layout of the other divisions, the built-up area under the residential houses and streets of both the middle town and the lower town is marked by several projections and recesses like those of a classical Indian temple. Two-thirds of the middle town is laid out with three projections and two recesses provided on either side of the arterial street running from east to west. One projection is made jutting out in the west on either side of the same street. While on the east, the built-up area is extended close to the eastern wall which too is separated from the former by a street. On the west, a wide stretch of vacant land was left. As a result, there are six open areas, the precise function of which remains to be known. It is indeed a novel method of layout hitherto unknown at other Harappan sites. As usual, there are major and minor streets and lanes which normally cut each other at right angles.

Reservoirs

The Harappans were extremely conscientious in storing the maximum possible volume of water that used to flow in the flanking streams after downpours. For that purpose, they created 16 or more reservoirs within the city-walls. A rough estimate shows that approximately 10 hectares, i.e., 20% of the total walled area, was appropriated only for the storage of water harnessed from the streams by way of raising several dams. There are at least three or four dams across the Manhar in the south and two or three across the Mansar in the north. In addition, there might have been quite a few inlet channels piercing through the city walls for bringing in the surface runoff. There are some rocky outcrops which were efficiently used for damming the streams. In fact, the builders had started to reduce the velocity of the water flow further upstream by way of raising a series of dams across them so that the real dams could successfully hold water as well as divert the surplus to the series of reservoirs within the city. It is noteworthy that the gradient between the higher east and the lower west of the city is 13 metres, an ideal situation for having reservoirs. There was a thick stratum of useful earth all over the area which still lies beneath the built-up area of the city. But those natural sediments were removed to the bedrock in the area appropriated for the series of water storage tanks. Massive partition bunds were built across the width at strategic places and at regular intervals. In the whole scheme, the city walls played the most crucial role. First, they served the purpose of being formidable protection to the city. In addition, they were extremely effective bunds made of millions of moulded sun-dried bricks carefully laid in mud-mortar. In order to save them from the water stored in the tanks, a broad road lined with stone-masonry walls was provided. This road served the purpose of a bund as well as that for easy movement of men and material. Further, the area reserved for the tanks was immense. In such a situation, also keeping in mind the general gradient of 13 metres, it was necessary to construct a number of cross bunds across the width at necessary intervals for the following reasons:

1. To reduce the gravitational thrust of the stored water body and save the city walls from being washed away under the forward impact of the water;
2. Bunds served the purpose of causeways as well as for easier movement of the inhabitants, animals and vehicles; and
3. In case of poor inflow under erratic rainfall, the water could be stored in selected tanks instead of letting it spread out over a larger area in a thin sheet, which would have disappeared quickly due to evaporation and seepage.

Furthermore, to meet any exigency, deeper troughs or depressions were cut into bedrock so that some water could be available at lean times. In the course of making test probes, a trough or depression was found. Almost at all points, whether in the centre or close to a cross bund or at a place of supposed inlet channels, the Harappan pottery was always found sticking to the bedrock which, at most places, is lower than the present rocky or sandy bed of the flanking runnels. The sediments deposited in the area of an inlet channel have revealed the same ceramic sequence which is found at the site. In one of the bunds, near the most conspicuous dam site on the Manhar, a spillway was found which was used for letting the surplus water into the reservoirs provided along to the south of the citadel.

Most significantly, satellite imagery suggests that there should be a large buried reservoir, most likely an artificial one, to the south-west of the city. It is a contiguous area now affording one of the best cultivated fields in the locality. If so, it must have been receiving the surplus water escaping from those within the walls. Interestingly, the area surrounding the suspected reservoir is dotted with several Harappan funerary structures, including circular elevations which appear to be sepulchral mounds entombing the mortal remains of privileged persons or families. It may be recalled that in the Indian tradition, the funerary rites or the disposal of the dead are performed close to a river, a lake, or a tank. This location was therefore ideally suited for special funerary structures.

In the prime of its youth, the entire city might have looked like a lake city or a "jaladurga" (water fort). Reservoirs seem to have been kept regularly desilted, and the removed matter was found at places to be piled up on the nearby bunds which, in turn, were being protected by masonry walls raised from two sides. Such bunds varied in width from 4.5 metres to upward of 7 metres, depending on the location and use of such bunds. Another interesting feature in close proximity to important bunds was built-up areas of multi-roomed or multi-blocked structures, probably intended for the personnel posted there for the proper maintenance and security of the bunds and reservoirs. At such places, where some important entry gates are suspected to be buried, the density of habitational structures increases. It is not implausible that staff was posted there for regulating the entry and exit of persons to and from the city.

The foregoing account demonstrates that the Harappan city at Dholavira was a city par excellance in overall planning, detailed resolution which were done with mathematical precision in all measurements. It is also unique for its reservoirs aesthetically and proportionately arrayed within the city-walls. This too speaks eloquently for the Harappan's hydraulic engineering as well as concern for water conservation. They had surely known that the water that was thus stored enriched the acquifer too besides catering to their various requirements and enhancing the beauty and the environment of the city. Furthermore, all the Harappan settlements are oriented some degree off the present-day magnetic north – either to the east or the west: thus suggesting that for the determination of directions, situation or path of movement of some heavenly bodies were followed. The excavation is an ongoing process. More exposure will add more to the site and its planning.

II

URBAN PLANNING IN *VASTUSASTRA*

Krishna Deva

According to the ancient Indian *Vastusastra*, a city should be founded on the bank of a perennial source of water (like a river or a lake) with an easy access both from land and water and with attractive prospects of trade and commerce, which presuppose a prosperous hinterland. There are many grades and types of cities—large, medium, and small; commercial and administrative; etc. The ideal shapes of a city are square (Fig. 1), rectangular (Fig. 2), circular (Fig. 3), and elliptical (Fig. 4). Certain shapes like triangular (Fig. 5), hexagonal, barley-shaped, *vajra*-shaped, trident-shaped, and *karnikara*-shaped are inauspicious and to be avoided.

A capital city should be in the heart of the *janapada* and is to be planned on the 64 *pada* system. It is to be protected by a fort wall which is built over a mud-rampart, surrounded by a moat. The fort wall is to be strengthened by bastions at regular intervals and provided with crenellations and secret chambers and pill-boxes for purposes of defence and offence.

Three *raja-margas* (spinal roads) should run from east to west and three from north to south, and these 12 nodal points are to terminate in as many gates piercing the fort wall. The spinal roads are to be divided at right angles by streets, lanes, and sub-lanes of gradually diminishing width, in a grid pattern.

Definite areas and directions are prescribed within the fortified city for market places, public parks, gardens, tanks, step-wells and temples of various deities. Specific sectors and directions are also assigned for royal palaces and stables, administrative offices and residences of state dignitaries and officials (in relative proximity to the royal palace according to ranks), various *varnas* (classes of populace) and professionals, different practitioners of arts, crafts and industries within the city, and for certain specified castes and practitioners of crafts outside the city limits.

The *Kautilya Arthasastra*, a compilation dated between the 4th century BC and 1st century AD, uses the term *janapada* alternately for the kingdom or the countryside, and *Pura* for the city and *Paura* for the citizen. This text defines *Sthaniya* as the centre of 800 villages and recommends it as suitable for locating the *Durga*, or the fortified capital.

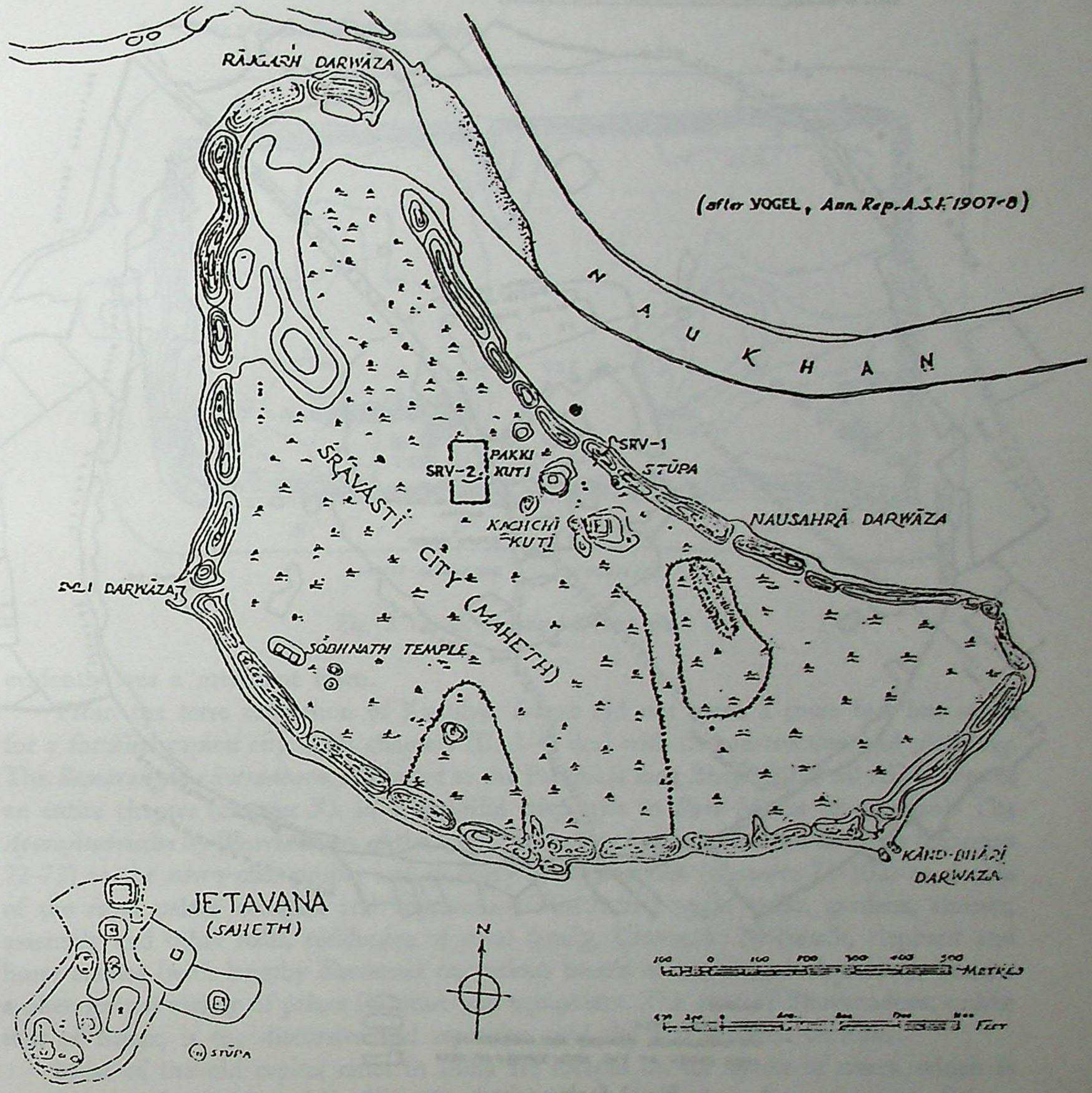

RĀJGARH DARWĀZA
(after VOGEL, Ann. Rep. A.S.I. 1907-8)
NAUKHAN
SRV-1
STŪPA
PAKKI KUTI
SRV-2
ŚRĀVASTĪ CITY (MAHETH)
KACHCHĪ KUTĪ
NAUSAHRĀ DARWĀZA
IMLI DARWĀZA
SOBHNATH TEMPLE
KĀND-BHĀRĪ DARWAZA
JETAVANA
(SAHETH)
STŪPA
N
100 0 100 200 300 400 500 METRES
FEET

Fig. 1 Sravasti, crescentic town plan

Further, the same text envisages *Dronamukha* and *Kharvatika* as smaller towns at the centre respectively of 400 and 200 villages. While Vatsyayana speaks of *Nagara*, *Pattana* and *Kharvata* as urban centres, the *Divyavadana* brackets together *Nagara*, *Nigama*, *Karvata* and *Rajadhani* in a similar sense. The *Amarakosa* (c. 5th century AD) cites *Pur*, *Puri*, *Nagari*,

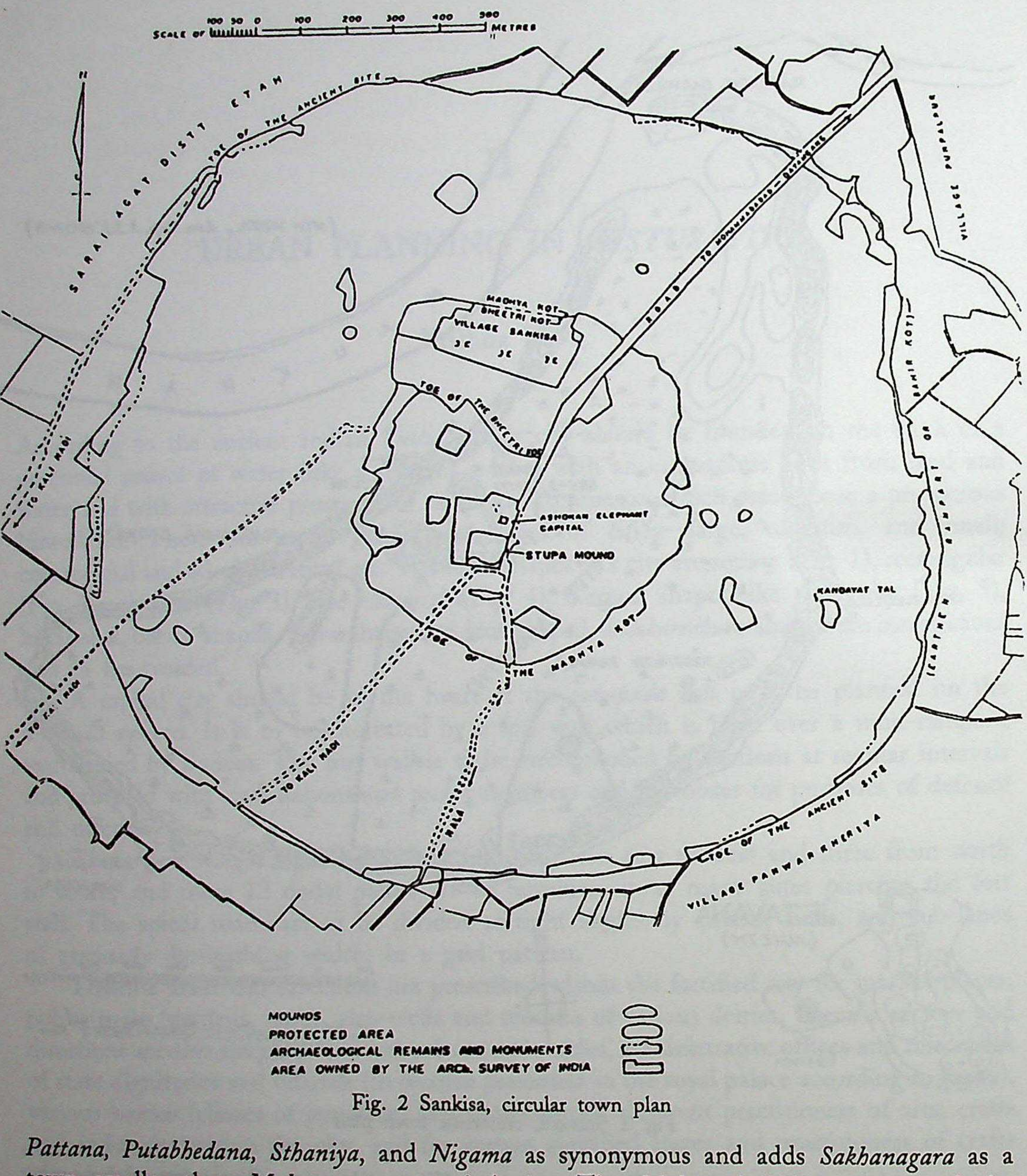

SCALE OF METRES
100 50 0 100 200 300 400 500
SARAI AGAT DISTT ETAH
TOE OF THE ANCIENT SITE
ROAD TO MOHAMMADABAD — DATAGANJ
VILLAGE PURPALPUR
MADHYA KOT
BHEETRI KOT
VILLAGE SANKISA
TOE OF THE BHEETRI KOT
ASHOKAN ELEPHANT CAPITAL
STUPA MOUND
BANIR KOT
EARTHEN RAMPART OR
KANDAYAT TAL
TOE OF THE MADHYA KOT
TO KALI NADI
TO KALI NADI
TO KALI NADI
NALA
TOE OF THE ANCIENT SITE
VILLAGE PANWAR KHERIYA
MOUNDS
PROTECTED AREA
ARCHAEOLOGICAL REMAINS AND MONUMENTS
AREA OWNED BY THE ARCH. SURVEY OF INDIA

Fig. 2 Sankisa, circular town plan

Pattana, Putabhedana, Sthaniya, and *Nigama* as synonymous and adds *Sakhanagara* as a town smaller than *Mulanagara* or capital city. The *Mahaparinibbhana-Sutta* and the *Milindapanho* refer to Pataliputra and Sagala as *Putabhedana*, while Kautilya explicitly specifies that a *Sthaniya* should be *Panya-Putabhedana*, i.e., a place where parcels of merchandise are opened, thus visualizing the city also as a commercial centre, *Nigama*

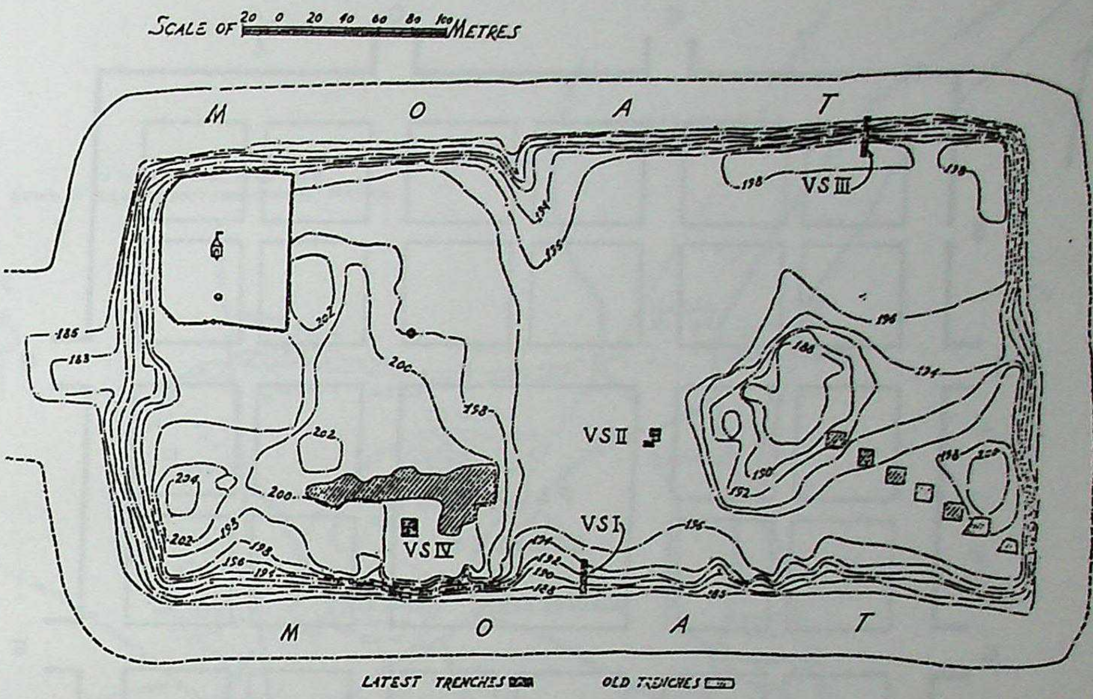


Fig. 3 Vaisali, rectangular town plan

evidently was a merchant town.

From the terse exposition of Kautilya, *Durga* did not mean a mere fort but stood for a fortified capital city. Two chapters (II. 3-4) deal with its construction and planning. The *Samarangana Sutradhara*, attributed to the Paramara king Bhoja (1010-50 AD), devotes an entire chapter (chapter X), in a beautiful crisp style to *Pura-Nivesa* (town-plan). The *Aparajitapriccha* by Bhuvanadeva of the late 12th century has assigned two chapters (chapters 72-73) to the town-plan proper and as many as 29 chapters (chapters 74-102) to details of the royal palace complex and appurtenances including wells, tanks, gardens, shrines, assembly and other halls, residences of royal family, *Chitrasala*, *Nrityasala*, elephant and horse stables (with lengthy discourses on various breeds of horses and elephants), besides a phenomenal variety of palace furniture and equipment. The style of Bhuvanadeva, unlike that of Bhoja, is too discursive and repetitive, and the text is often corrupt.

Most of the old capital cities in India are located on the banks of rivers, which is an ideal situation envisaged by the architectural canon. As such, at least one side of these cities definitely extends to the river face, which seldom conforms in nature to a strict geometrical form. In such cases, the prescribed shapes of square, rectangular or circular for cities remain just ideals which are rarely achieved. Pataliputra (represented by modern Patna) on the Ganga and Ujjain on the Sipra are cases in point. Pataliputra extends like a ribbon along the Ganga and was described as such by Megasthenes (who was not distant in time from Kautilya, traditionally believed to be the minister of Chandragupta Maurya)

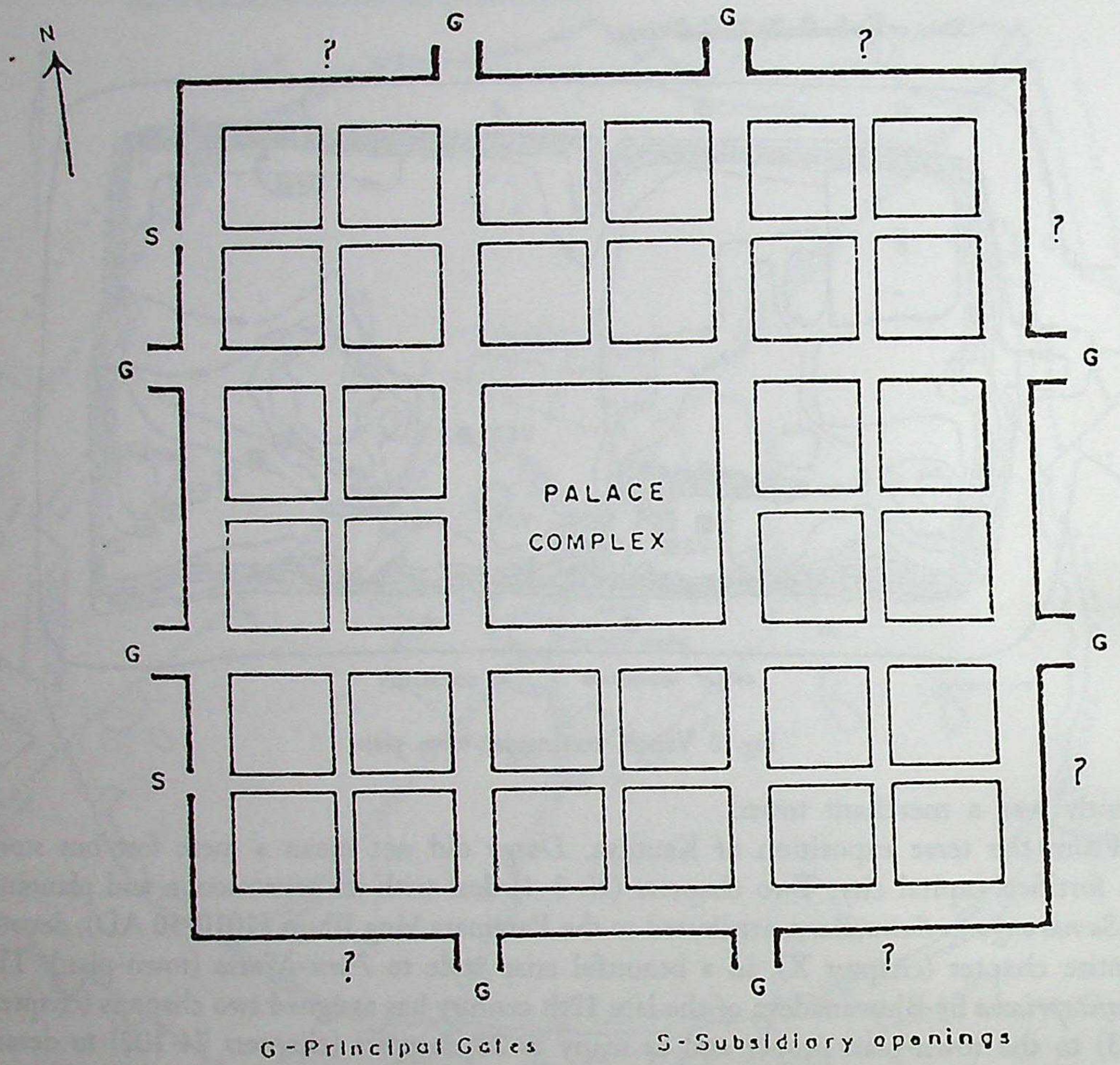


Fig. 4 Sisupalgarh, square town plan

to be 14.5 km long and 2.4 km wide. The fortified site of Ujjain has a notched configuration on the river side conforming to a bend in the river. Sravasti (Maheth) is situated on the bank of the Rapti and has a crescent shape (Fig. 6), much like the present city of Varanasi on the Ganga. Both conform accurately to a bend of the river skirting the habitation.

There are, however, a few old excavated city sites with fortifications that answer to the shapes recommended by the architectural texts. One is the old town of Sankisa on the Kali Nadi in district Farrukhabad, which is circular in form (Fig. 3), about 1,200 m in diameter. The fortified site of Vaisali, the capital of the Licchavi *gana* in North Bihar, known as Raja Vishal-ka-Gadh, is a regular rectangle (Fig. 2), measuring 540 x 275 m, girdled by a 40 m wide moat. A rare old fortified town, which is a perfect square

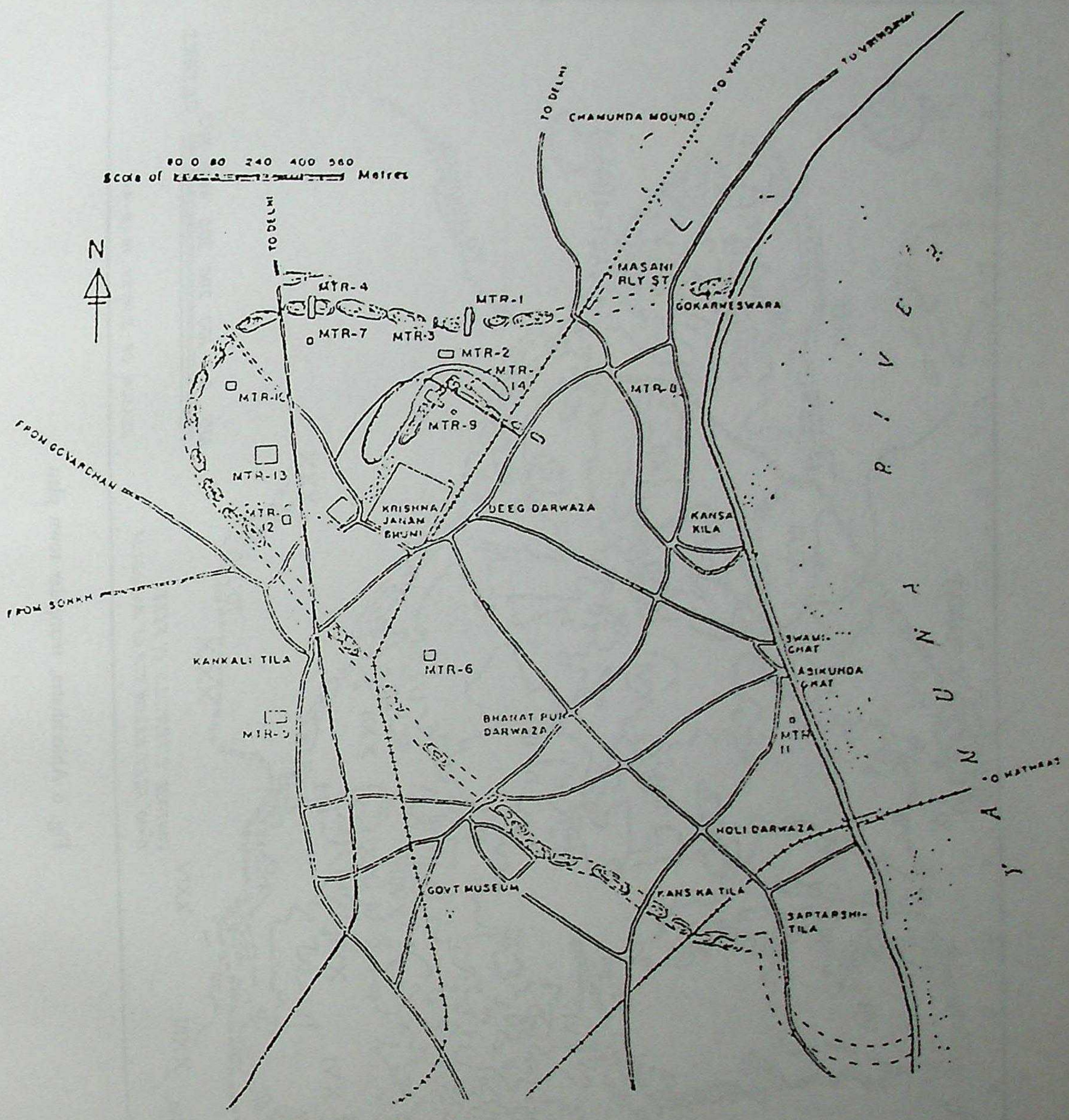

TO VRINDAVAN
TO VRINDAVAN
TO DELHI
CHAMUNDA MOUND
80 0 80 240 400 560
Scale of Metres
N
TO DELHI
MTR-4
MTR-1
MASANI RLY ST
GOKARNESWARA
MTR-7
MTR-3
MTR-2
MTR-14
MTR-10
MTR-9
MTR-8
FROM GOVARDHAN
MTR-13
MTR-12
KRISHNA JANAM BHUMI
DEEG DARWAZA
KANSA KILA
FROM SONKH
KANKALI TILA
MTR-6
SWAMI GHAT
ASIKUNDA GHAT
MTR-5
BHARAT PUR DARWAZA
MTR 11
TO HATHRAS
HOLI DARWAZA
GOVT MUSEUM
KANS KA TILA
SAPTARSHI TILA
YAMUNA RIVER

Fig. 5 Ancient Mathura, Elliptical town plan

(Fig. 1) is Sisupalgarh, situated close to Bhubaneswar and plausibly identified with the ancient town of Tosali mentioned in the Asokan rock-edict at Dhauli, hardly 5 km away. The site, each side measuring 1.2 km, is protected by a fort wall, encircled by a moat

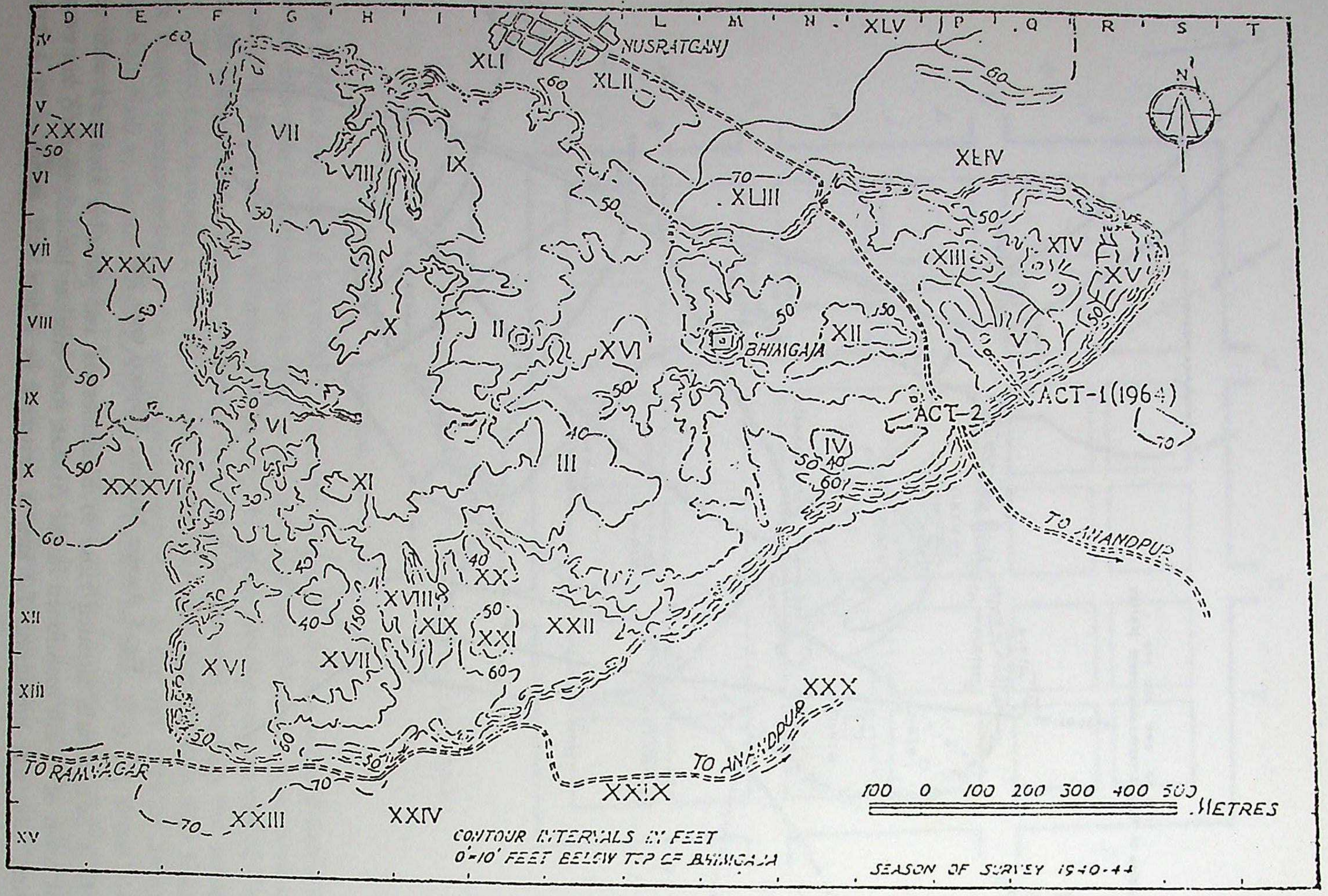
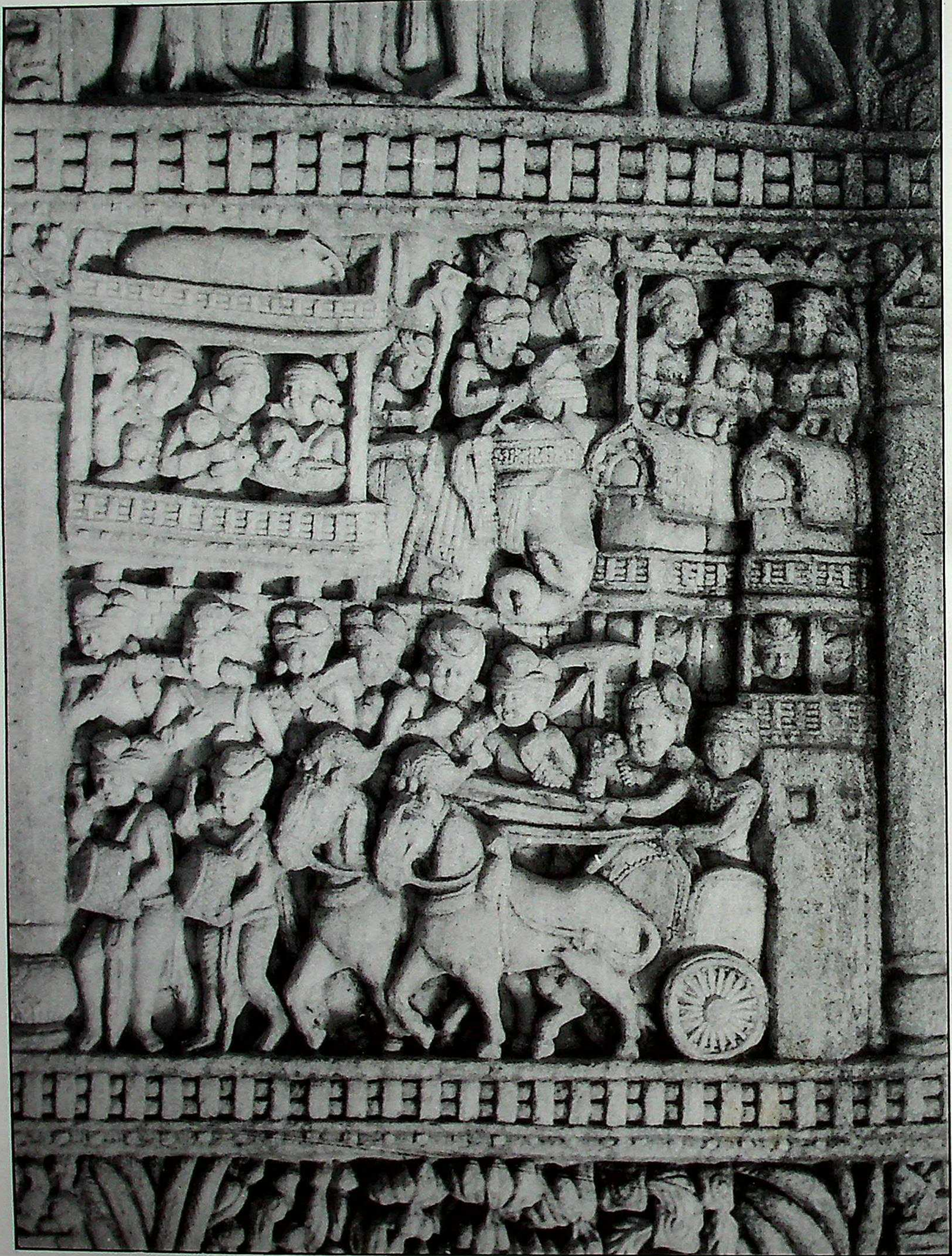

D E F G H I L M N XLV P Q R S T
IV V VI VII VIII IX X XII XIII XV
N
NUSRATGANJ
BHIMGAJA
ACT-1 (1964)
ACT-2
TO ANANDPUR
TO ANANDPUR
TO RAMNAGAR
XLI XLII XLIII XLIV
XXXII XXXIV XXXVI
XXIII XXIV XXIX XXX
II III IV V VI VII VIII IX X XI XII XIII XIV XV XVI XVI XVII XVIII XIX XX XXI XXII
30 40 50 60 70
100 0 100 200 300 400 500 METRES
CONTOUR INTERVALS IN FEET
0'-10' FEET BELOW TOP OF BHIMGAJA
SEASON OF SURVEY 1940-44

Fig. 6 Ahicchhatra, triangular town plan



Pl. 2.1 Sanchi, royal procession issuing out of a city gate, 1st century B.C.

fed by a perennial stream. The defences consist of a massive mud rampart (*Vapra*), overbuilt by a *Prakara* (wall) of earthen core with brick facings. Two gateways symmetrically pierce the fort wall on each side, articulating 8 gates, each facing a spinal straight road in a regular grid pattern (Fig. 4). Excavation of one of the gates, built of large stone blocks with brick superstructure, revealed an elaborate plan with an ancillary passage, a guard-room, and lateral stairs for ascent to the upper storey of the gate house and the connected fort wall. A road passed through this gate, bearing track marks of vehicular traffic. The exposed plan of Sisupalgarh squarely answers to the fortified square town plan of Kautilya. The difference is that instead of 3 spinal roads running east-west and three across, as prescribed, the site has 2 roads east-west and 2 across, forming a grid with 8 nodal points for gates instead of 12. As the site was continuously occupied from c. 300 BC to c. AD 350 this town was probably the capital of the Kalinga kingdom invaded by Asoka, an event that proved a landmark in Indian and Asian history.

All available texts agree regarding the basic constituents of the town plan, which envisages its layout on the system of 64 *padas* and its protection by a fort-wall girdled by a moat. The fort-wall was pierced by 3 main gates on each side connected by spinal roads, 3 running east-west and 3 across. Each main gate was strengthened by flanking towers for watch and ward besides a screen wall and rows of multi-storied guard-rooms, a check-post (*Simagriha*) and a toll office. The Sanchi bas-reliefs depict royal processions and cavalcade issuing out of the fortified towns of Rajagriha and Sravasti through gates flanked by towering structures (Pl. 2.1). In the scene of the War of Relics the fortified gates of Kusinagara, with numerous tall structures around it, are all thronged by archers and armoured soldiers ready to fight.

Besides the main gates, a city, according to the Silpa texts, should also have ancillary passages, known as postern or wicket gates, to admit citizens or authorized persons to enter the city when the main gates were closed. The intersections of the spinal roads were marked by large platforms (*catvaras*), which served either as places for shrines of popular deities like Yaksas or for public functions. Besides the spinal roads that led out of the city there were also streets, lanes and sub-lanes, totalling 17 in all for internal communication.

All texts agree regarding the siting of the royal palace complex on one-ninth of the total town area to the north of its centre, and residences of the ministers, high dignitaries, and main administrative offices like the treasury and the armoury, around the palace complex. There is also complete agreement on the placement of the four *Varnas* and some of the essential civil and military establishments like the armoury. There is consensus also in placing the out-castes, the cremation ground, and the *Caityas* (Buddhist *stupas*) outside the city limits.

Kautilya evinces definite distrust of the foreigners, heretics, jugglers and wandering showmen and recommends their being kept out of the city. The later texts had no such provision against foreigners and heretics, since with the expansion of commerce, foreigners were welcome and the Jaina merchants formed an important section of the rich Vaisya community. Kautilya lays down specific directions for all the civil and military offices, as well as for the various professions and practitioners of arts and crafts. The later texts are more liberal and pragmatic. The *Samaranganasutradhara* (X. 101) clearly provides that merchants of all commodities, physicians, chiefs of state departments and particularly armed forces, are to be placed in all directions of the town.

Again, Kautilya prescribes only a few selected divinities to be enshrined inside the city. These are Durga, Vishnu, Jayanta, Indra, Siva, Kubera, Asvins, Lakshmi and Madira (probably the mother-goddess). The later texts, however, provide a more comprehensive list of divinities, including the familiar Brahmanical Trinity, Surya, Ganesa and Karttikeya, and specify that Siva may be enshrined at all places and in all directions, stressing the popularity of Siva worship.

Samaranganasutradhara reads like a commentary on Kautilya, but reveals the beginning of the medieval tendency of theoretic canonization by dividing almost all constituents of the town-plan into three categories: large, medium and small. This tendency becomes an obsession with the *Aparajitapriccha*, which not only defines 20 different types of *Pura* (town), each with separate designation, but extends such categorization to all constituents of the town. A pedantic list of possibilities is revealed, and thus the book becomes a theoretical treatise rather than a practical manual and guide.

III

APPLICATION OF GEOMETRY IN THE PLANNING OF AN ANCIENT SETTLEMENT: SISUPALGARH, A CASE STUDY

M.C. Joshi

The initial idea in the terms of antiquity to have a planned settlement represented a definite advancement in the process of cultural evolution and technological growth. Conceptually, the planning of a rural or urban habitation presupposes the existence of a controlled social structure or organisation under a strong single or collective authority. This postulate has particular significance in the context of early cultures of the Old Word and their chronology. Of the planned settlements in India, the antiquity could be traced back to *circa* third millennium BC during the Copper/Bronze age. However, it is from the early historical period onwards that more evidence, both archaeological and literary, is available in India on the laying out of habitational sites, especially those that are urban in nature. Settlements subjected to planning comprised mainly two types, *viz*, partly planned and fully planned. The former variety could be observed in those sites where some sort of habitation was already in existence. Later, out of some necessity, the area was brought within a fortified enclosure, introducing some elements of planning. Representatives of the second type could be found in such habitations or townships which were conceived and planned before these were brought under occupation.

Features of planning at an archaeological site can generally be detected in its extant system of roads, alignment of structures, gates, and fortification. According to literary as well as archaeological evidence available in India, a settlement has to be conceived and designed by keeping in view the existing contours, water-sheds, and topography of an area selected for the purpose. A site for building a city had to be surveyed and measured first. Thus, the knowledge of geometry and its application was a prerequisite for the planners of a settlement, besides familiarity with techniques of construction and the capacity to handle the required building material keeping in view the geology of the site, composition of the soil, availability of water, etc.

Amongst the early texts, Kautilya's *Arthasastra* (Kangle 1986: 36) provides us some details about fortified urban sites. It states that a township should be founded on an ideal piece

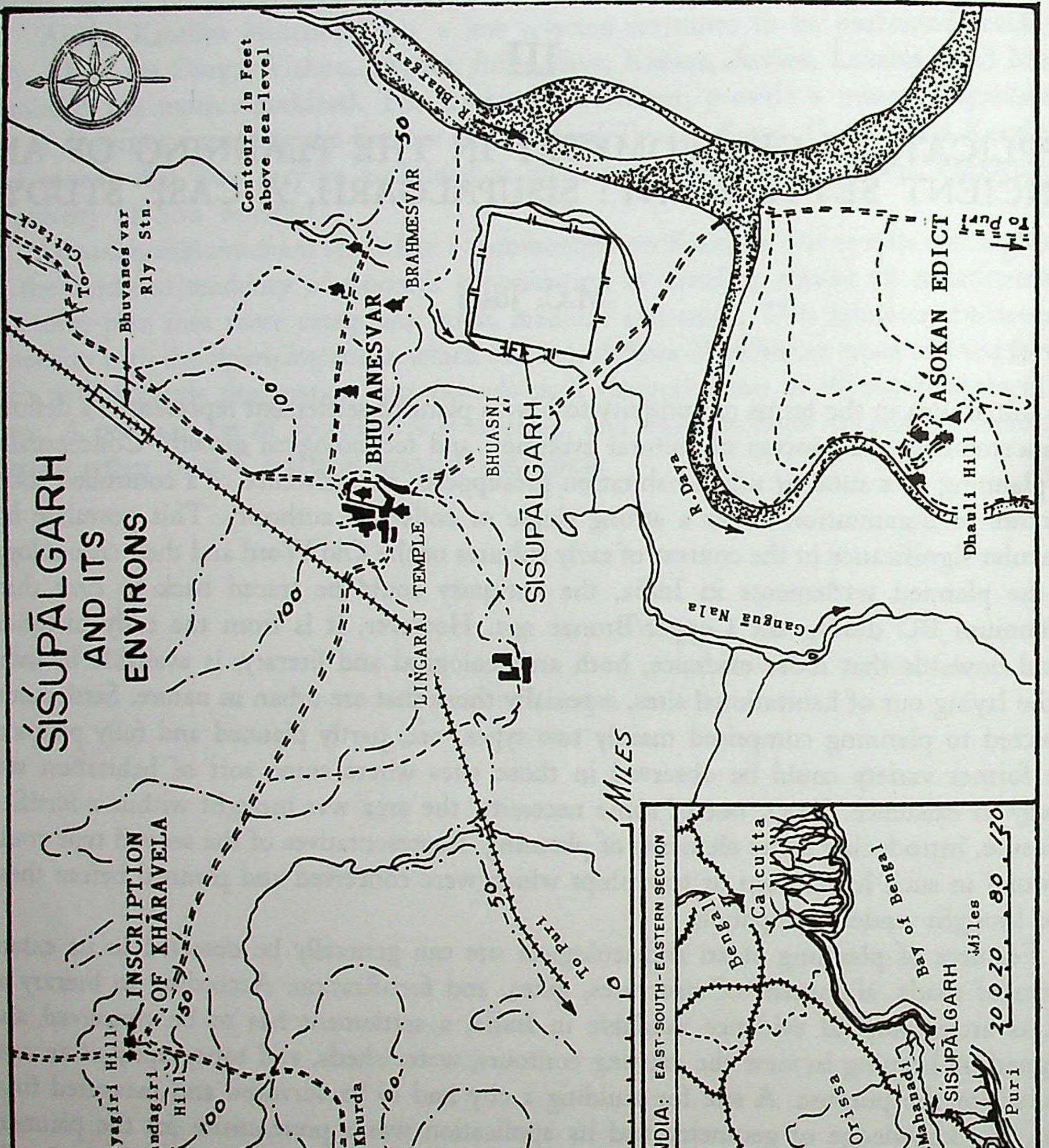

ŚISUPĀLGARH AND ITS ENVIRONS
To Cuttack
Bhuvanesvar Rly. Stn.
Contours in Feet above sea-level
R. Bhargavi
BRAHMESVAR
BHUVANESVAR
LIṄGARAJ TEMPLE
BHUASNI
ŚISUPĀLGARH
R. Daya
ASOKAN EDICT
To Puri
Dhauli Hill
Gangua Nala
INSCRIPTION OF KHĀRAVELA
Udayagiri Hill
Khandagiri Hill
To Khurda
To Puri
50
100
150
0
1 MILES
INDIA: EAST-SOUTH-EASTERN SECTION
Bengal
Calcutta
Bay of Bengal
Orissa
R. Mahanadi
SISUPĀLGARH
Puri
Miles
20 0 20 80 120

Fig. 1 Sisupalgarh : and its environs

of land as specified by experts, on the confluence of rivers or by the sides of a tank. The shape of an urban site could be circular, rectangular or square as per the available land contours. The fort should be protected with one or more surrounding moats.

Kautilya prescribes three types of elevation for raising a fortification-wall, *viz*., (i) *Urdhva-caya*, i.e., raised as high-heap, (ii) *Manch-prista*, i.e., with flattened top and (iii) *Kumbha-kuksika*, i.e., with tapering or curved body. These walls are to be provided with merlons, pavilions, bastions and gates (Kangle 1986:36).

In the present context, however, it may be particularly relevant to refer to Kautilya's plan of a city (Kangle 1986:36). An urban site is to have three roads running east-west and three north-south, crossing each other in between and connected with three corresponding gates on each side, suggesting thereby a square plan for the fortification. He specifies that the ninth part of the total area of the town on the north should be demarcated for the royal harem. He has also indicated locations for the construction of different types of shops, markets, tanks, gardens, stables, houses of various communities, offices, stores, etc., within the proposed layout of an urban settlement. Regarding the central area of the city, Kautilya refers to niches (*kosthas*) enshrining ten divinities: Aparajita, Apratihata, Jayanta, Vaijayanta, Siva, Vaisravana (Kubera), two Asvins, Sri (Laksmi) and Madira. What deserves particular attention in the *Arthasastra* is a reference to *Vastu-devatas*, or the presiding deities of city architecture, to be installed in different regions (grids) of the square according to specified positions. These are in addition to the four divine guardians e.g. Brahma, Indra, Yama and Senapati (Karttikeya or the Varuna?) at each of the main four gates of the city, which is then turned itself into a sacred enclosure.

On the basis of orientation of roads and their number, it is definite that the plan of the town proposed by Kautilya was a grand square of possibly 81 grids (9 x 9) of which a ninth part was reserved for the royal harem. Even in the planning of a camp (military) township, the *Arthasastra* refers to nine as a significant number, for the entire city is to consist of a square of nine divisions only (Kangle 1986: 233 ff). It is thus clear that Kautilya had knowledge about the *Vastu-mandala* of 81 grids and divinities associated with it. Although he does not mention the *Vastu-Purusha* specifically, he seems to have known the concept.

Out of scores of extant remains of urban settlements, we now propose to take up a case-study of the ancient township of Sisupalgarh (20°13'30" and 85°51'30E) near Bhubaneswar in Orissa, owing to its relatively intact fortification. Our idea is to see whether it follows any tradition in regard to its layout. Limited excavations were carried out at this site by the Archaeological Survey of India in 1948, and according to the opinion of the excavator (Lal 1948: 66 ff), fortification at this site was founded in the first quarter of the second century BC, and subsequently it was repaired and provided with revetments in different phases. The site itself was under occupation from the early third century BC to about the middle of the fourth century AD, according to available excavated data. It has been identified variously with Tosali of Asokan edicts and Kalinganagara of Kharavela's inscription on the basis of circumstantial evidence.

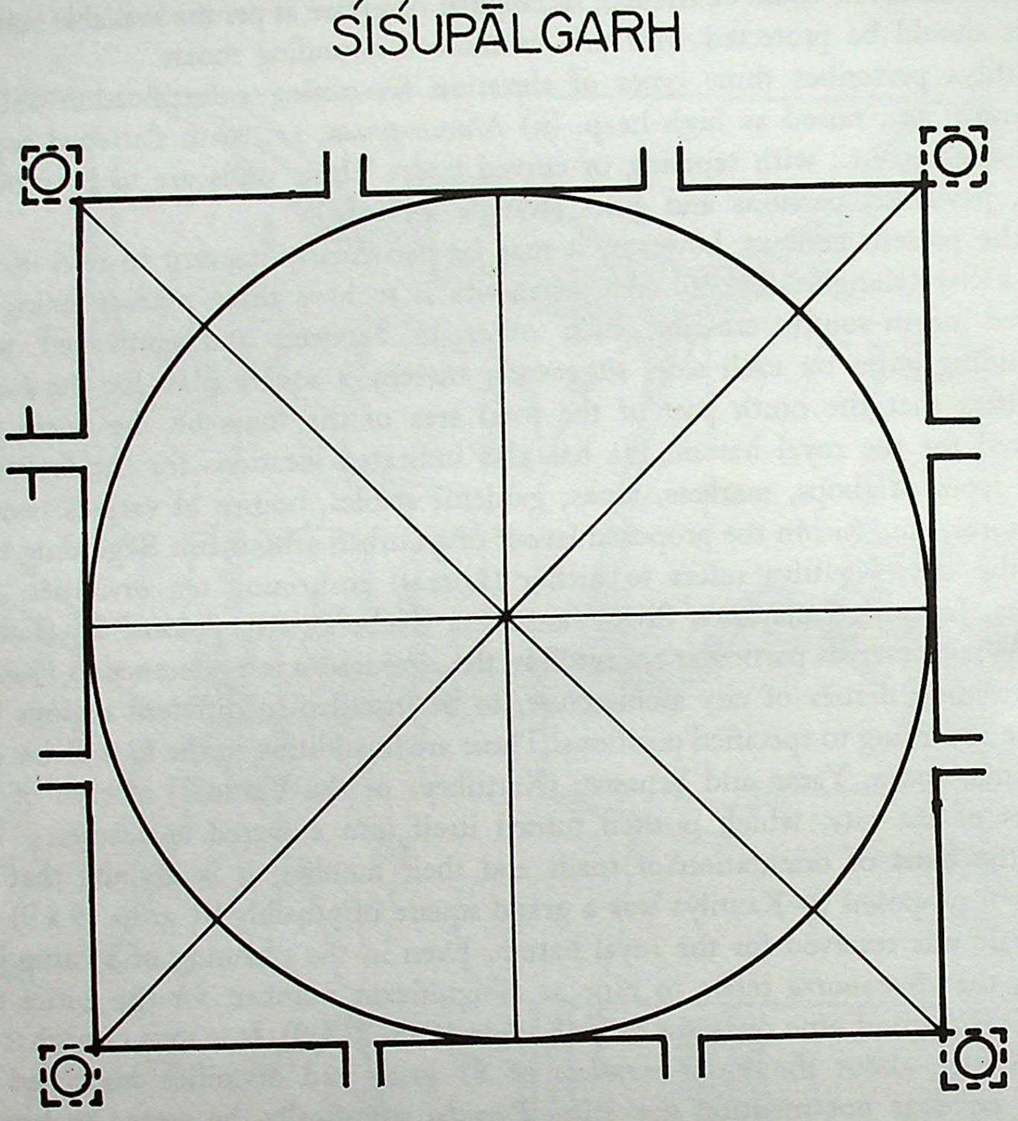
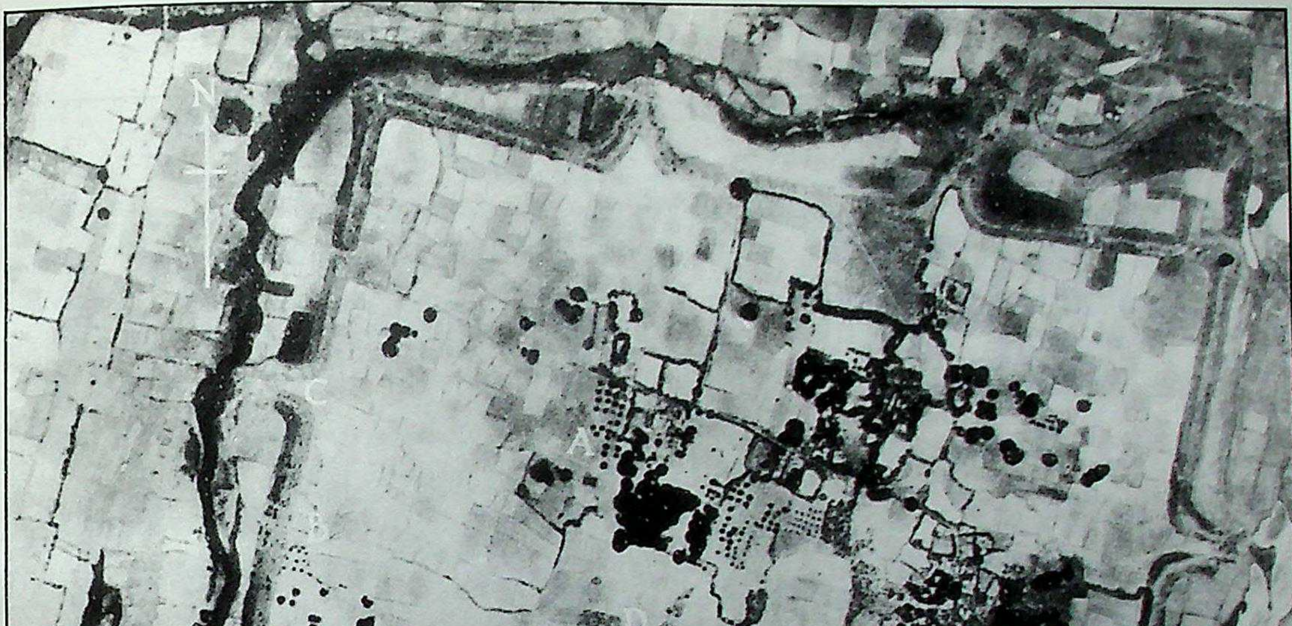


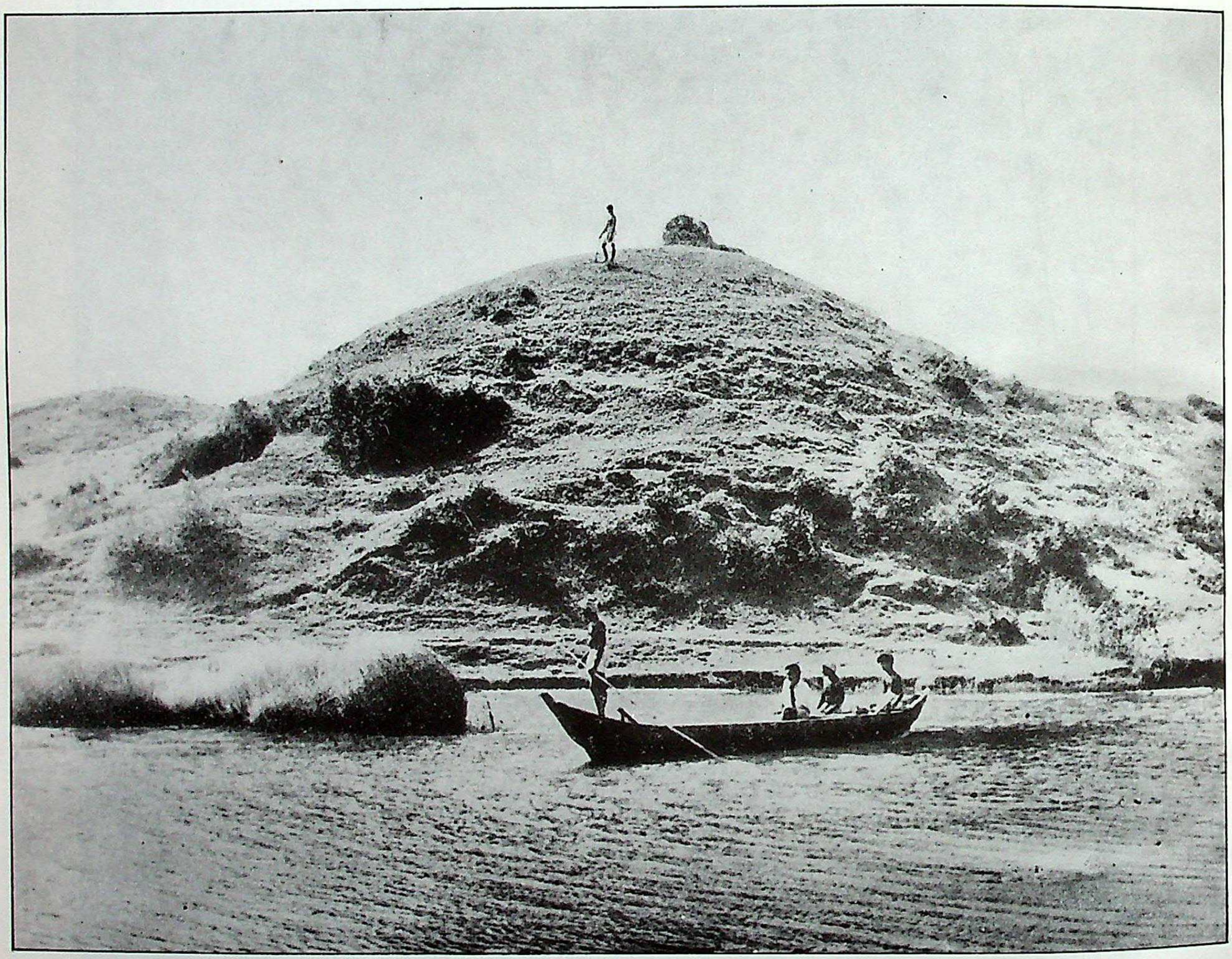
Fig. 2 Sisupalgarh : Locating the central point

The remains of the fortification at Sisupalgarh are roughly in the form of a square, with a moat around and two gateways on each side. Oriented approximately along the cardinal directions, each side of the fort measures slightly over one kilometre in length (Fig. 1 & Fig. 3).

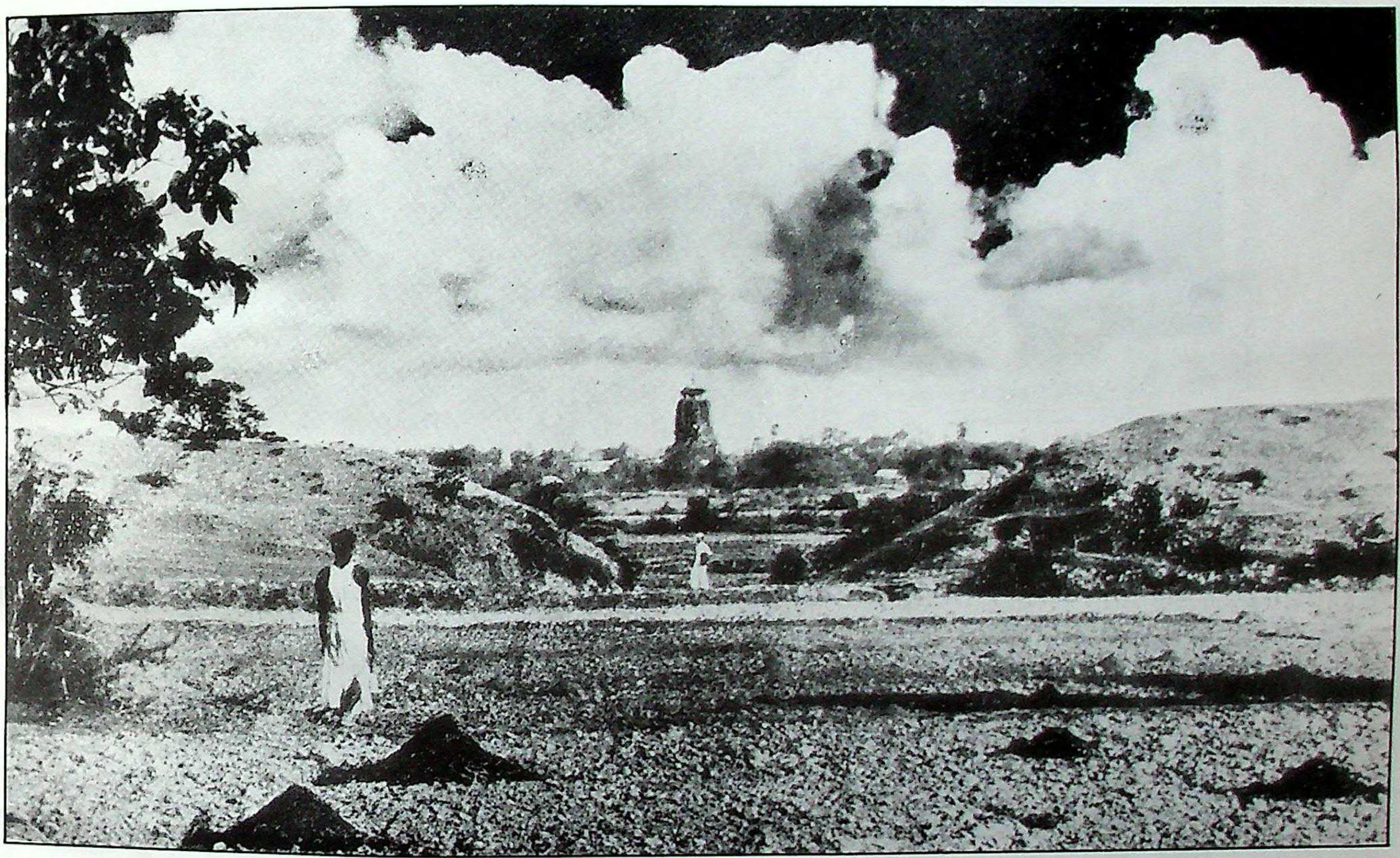
Ṭaking into account the orientation of the gates and likely road-alignments inside the fortified area, it seems that, originally, the road pattern formed almost a double-cross, creating quadrilateral areas in between for habitation. This kind of layout appears to follow a preconceived model, which plausibly had been formulated by fixing a central point to form a circle or rhombus to be turned into a square of a vast scale with nine major divisions (Pls. 3.1, 3.2 a, b & 3.3 a, b). Most probably the square plan of Sisupalgarh township



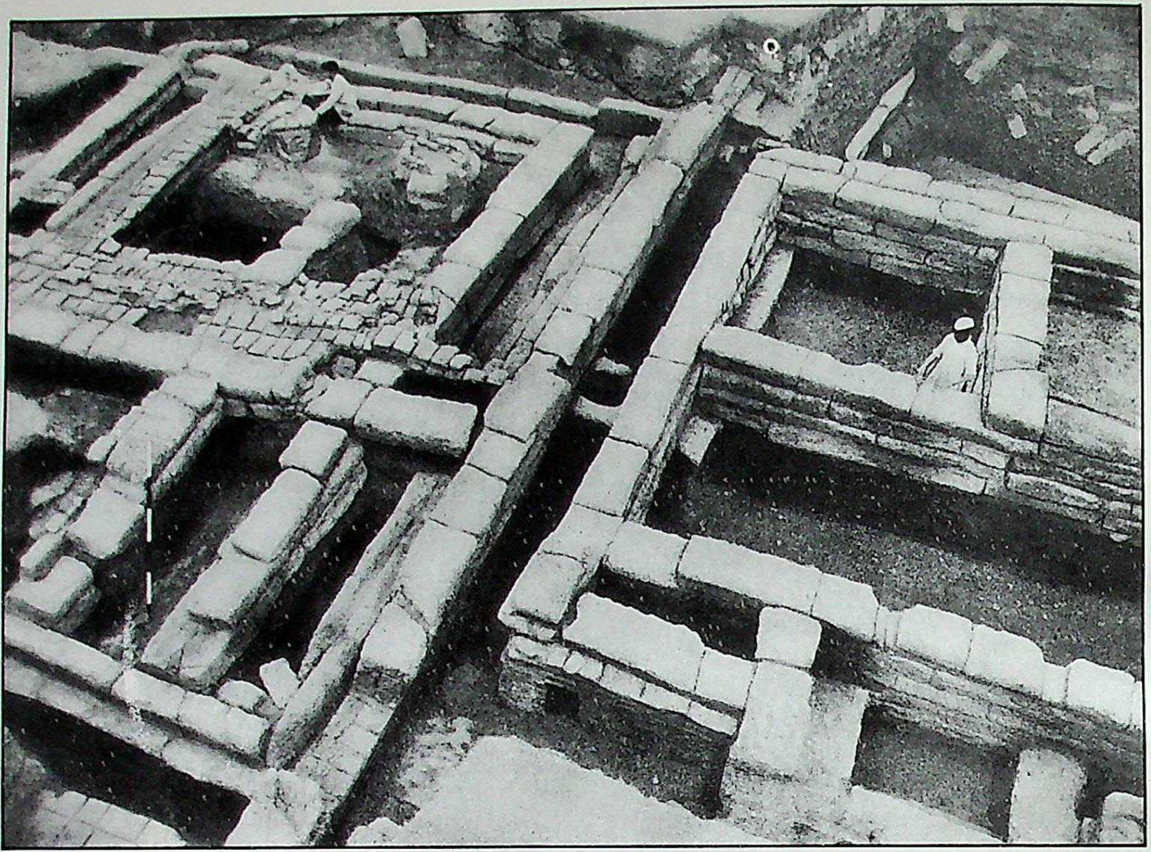
Pl. 3.1 Air-view of the Sisupalgarh site with fortified settlement



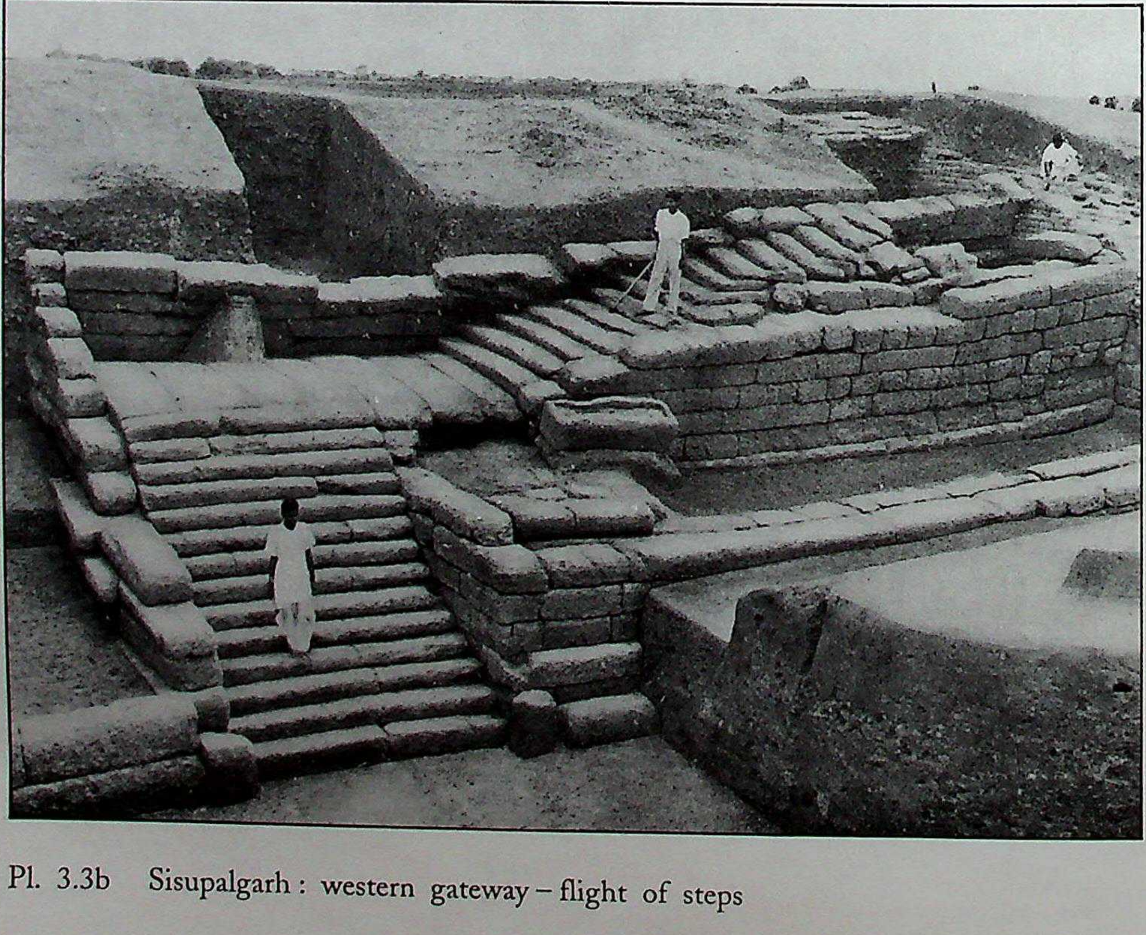
Pl. 3.2a Sisupalgarh : north-west corner tower



Pl. 3.2b Sisupalgarh : an opening across the fortification



Pl. 3.3a Sisupalgarh : habitation with fortification



Pl. 3.3b Sisupalgarh : western gateway – flight of steps

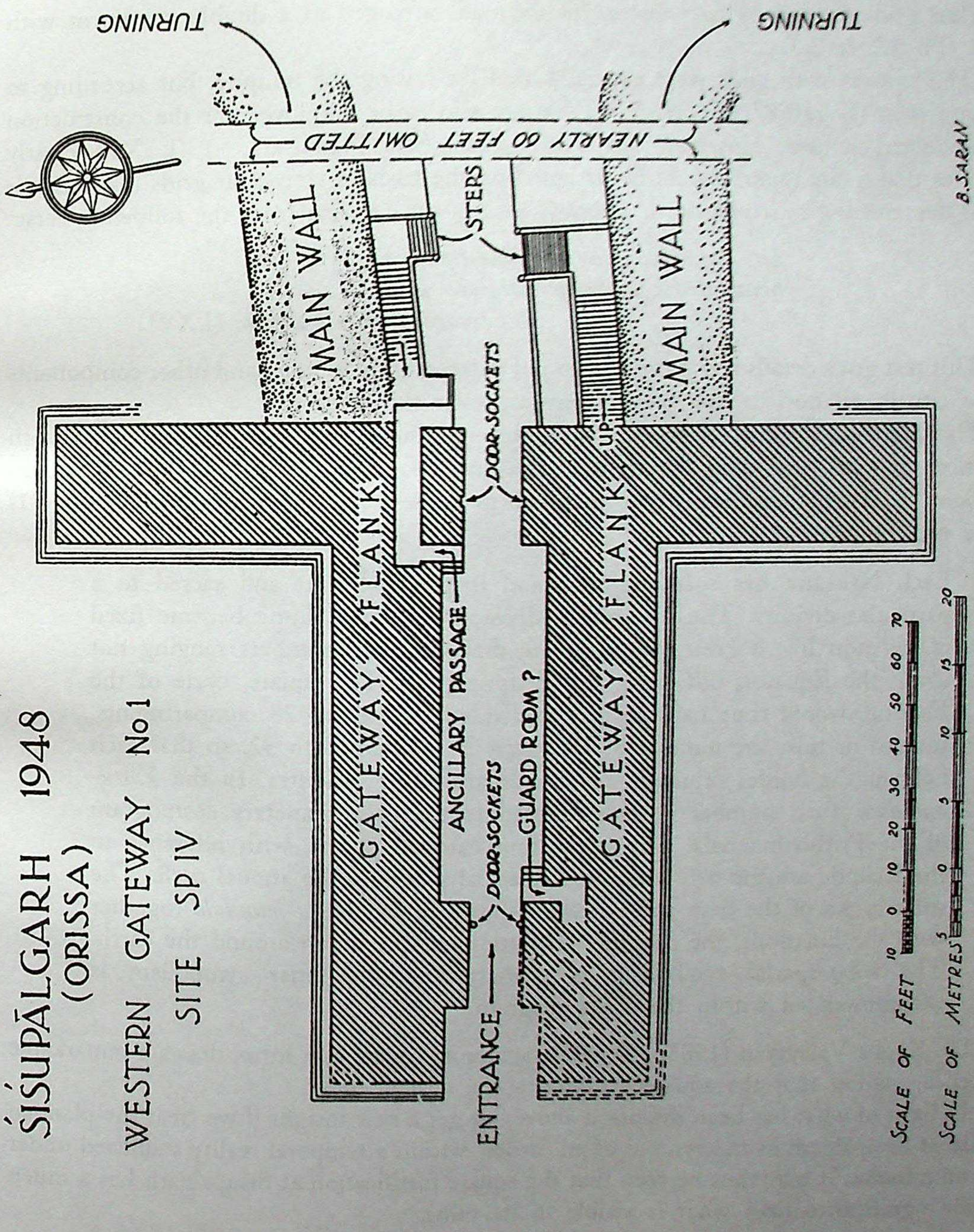

ŚIŚUPĀLGARH 1948
(ORISSA)
WESTERN GATEWAY No 1
SITE SP IV
TURNING
TURNING
NEARLY 60 FEET OMITTED
MAIN WALL
MAIN WALL
STEPS
DOOR-SOCKETS
GATEWAY FLANK
GATEWAY FLANK
UP
ANCILLARY PASSAGE
GUARD ROOM ?
DOOR-SOCKETS
ENTRANCE
SCALE OF FEET 10 0 10 20 30 40 50 60 70
SCALE OF METRES 5 0 5 10 15 20
B. SARAN

Fig. 3 Sisupalgarh : 1948 (Orissa) Western Gateway No. 1

was conceived as a *Vastu-mandala*, with eighty one grids employing traditional methods of land survey known in third second century BC (Fig. 2).

It thus follows broadly Kautilya's prescriptions for planning a settlement with nine principal grids formed by four instead of six roads arranged as a double cruciform with gates (Pl. 3.2 & 3.3).

The squares with grids were generally used for raising the temples, but according to *Brihatsamhita* (Iyer 1987, chapter 53), these are also to be employed for the construction of residential houses. However, *Samaranganasutradhara* (Sandisara,—) (I. XV) clearly indicates that a city (*pura*) should be designed on the basis of sixty-four grids (*chatuhsastipadas*) demarcating moat, bastions, gateway, etc., as can be seen from the following verse:

krte puranivese tha chatuhsastipadasraya |
niyuktaparikhasalagopurattalake' pi ca ||
Samaranganasultradhara (I.XV)

This text gives details about the location of palaces, royal kitchen and other components of the city in relation to the deities presiding over the grids.

The *Vastu-mandala* as discussed above, through the specific grids, is associated with a number of gods, including the signs of the lunar zodiac, viz. *Naksatras* in the Indian tradition. For further clarification we may like to quote Dr. Stella Kramarisch (1946: 31) in the present context:

> Each Naksatra has a leading star and is presided over and sacred to a particular divinity. The 27 and 28 divisions of the Ecliptic become fixed in position like a great, fixed, square dial with the numbers ranging not along the Equator, but along the Ecliptic itself. The square, cycle of the Ecliptic, would thus have to be sub-divided into 27 or 28 compartments. Instead of this, the number of Naksatras is augmented to 32, so that each field of the border represents a lunar mansion or Naksatra. In the *Vastu-mandala*, their number is thus adjusted to the helio-planetary cosmogram of the Prithivimandala. There, the four cardinal points, with reference to the Ecliptic are the equinoxial and solstitial points in the annual cycle. The solar cycles of the days and years are shown in the *Vastu-mandala* together with the lunations, the monthly revolutions of the moon around the earth. The solar-spatial symbolism is primary and the lunar symbolism is accommodated within the *Vastu* diagram.

Dr. Kapila Vatsyayan (1983: 77), while analysing square as a form, draws a remarkable inference, stating that the square symbolises the cosmic order.

In light of what has been discussed above, we get a new insight if we treat the planned square at Sisupalgarh as the symbol of an "order" within a temporal reality stabilised under a cosmic frame. It may thus be seen that the square fortification at Sisupalgarh has a much deeper significance than what is visible in its ruins.

In terms of the history of Kalinga, the construction of this fortified town in the early second century BC represented a great event, i.e., the establishment of an order under a local monarch following the political chaos during post-Asokan times. In fact, the fortified city or *Pura*, being one of the seven constituents of state (*saptanga-rajya*), also marked the foundation of the sovereign kingdom of Kalinga. It appears that author of Sisupalgharh as a planned city had drawn inspiration from Kautilya's *Arthasastra* to a considerable extent as already indicated by Prof. B.B. Lal ('Planned Cooperation Between Archaeologists and Scholars of Ancient Literature — A Crying Need' in *Man and Environment* Vol. XVI (1) ed. V.N. Mishra, Pune 1991). He has, however, shown that the total member of basically conceived grids (for the planned settlement) as thirty-six at Sisupalgarh where as we think that its ground-plan was conceived in terms of eighty-one grids well known to Indian Vastu traditions. Besides, in our view, the possibility of the central grid of groups of grids being occupied by a religious complex could not be ruled out.

ACKNOWLEDGEMENTS

All figures (except No.2) and photographs are due to courtesy of Archaeological Survey of India.

IV

CHITRAKUT: A HINDU TIRTHA AND ITS COSMIC GEOMETRY

D.P. Dubey, J.M. Malville and Rana P.B. Singh

> Approaching the sacred river covered with lilies,
> Lord Rama rested on the lovely hill of Chitrakut.
> Delighted He was to see it, surrounded by birds, deer,
> And so forgot the gloom of exile from his Ayodhya.
> The *Ramayana* by Valmiki (II. 56. 35)

Introduction

Throughout the Indian subcontinent there are regions wherein culture, geography, and the larger cosmos interact with each other to create a landscape that is infused with meaning and transcendent power. Many of these sites are *tirthas*, places of extensive mythological associations where many believe that spirit can cross between different realms. *Tirthas* may be important fordings of rivers, summits of hills where the heaven and the earth seem unusually close, or locations where gods and goddesses have entered the world to perform great deeds.

The *tirtha* of Chitrakut consists of large network of sacred sites covering some 30 km, which are interconnected by pilgrimage routes, myth, and tradition. The design of the *tirtha* was not planned under any imperial imperative nor was it the result of a chance build-up of isolated and unrelated sites. A celebrated destination of Hindu pilgrims for millennia, Chitrakut has been significantly empowered by its association with Lord Rama who with his brother, Lakshmana, and wife, Sita, spent the first stage of their exile in its vicinity. The resulting pilgrimage *mandala* of Chitrakut has a complexity and a geometric elegance comparable to that of a carefully designed cosmic city as defined by Meyer (1991), but without the intentionality of city planning of an imperial capital such as Vijayanagara or the urbanization of a sacred city such as Varanasi.

The present paper is based upon a combination of textual interpretation and recent field data obtained using the Global Positioning System of satellites (GPS). We shall

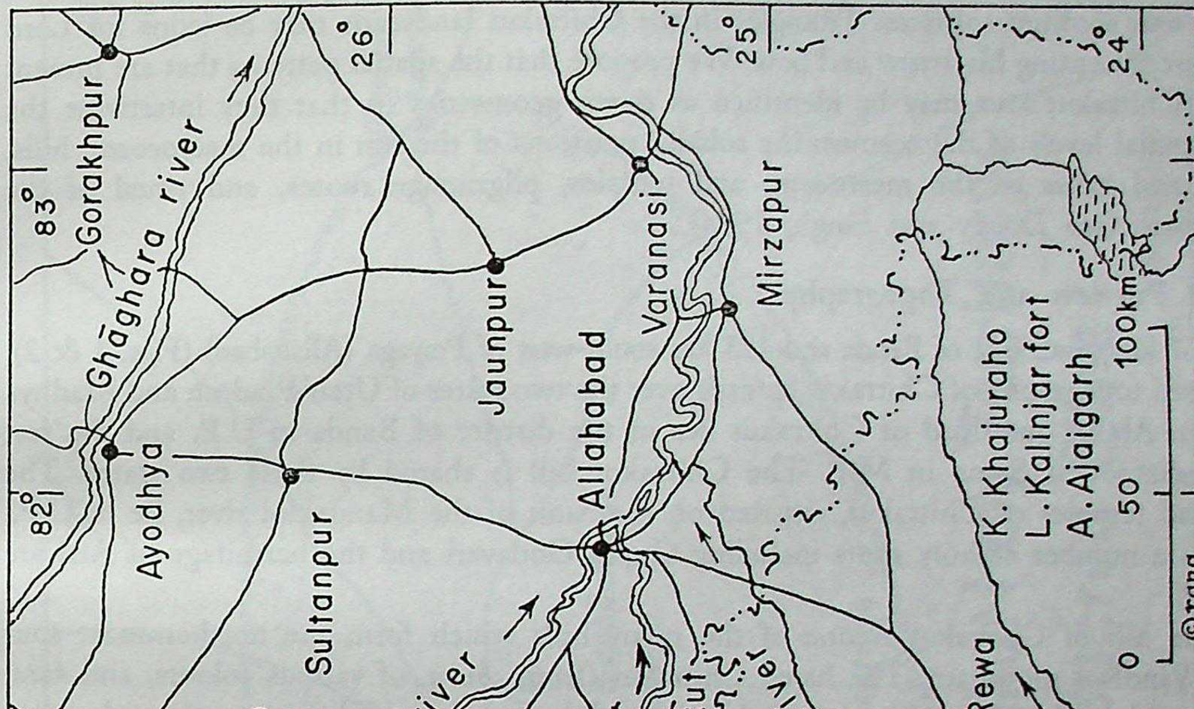

83°
Gorakhpur
Ghāghara river
26°
Jaunpur
Varanasi
25°
Mirzapur
82°
Ayodhya
Sultanpur
Allahabad
U. P.
Gaṅgā river
Yamunā river
Chitrakut
Tons river
M. P.
Satna
Rewa
K. Khajuraho
L. Kalinjar fort
A. Ajaigarh
0 50 100km
©rana
24°
Son river
Maihar
Nagod
Panna
81°
Lukhnow
Kanpur
Hamirpur
Banda
80°
Kalpi
Orai
Betwa river
Mahoba
Chhatarpur
K.
A
L
Ken river

Fig. 1 Regional setting of Chitrakut

demonstrate how the natural topography of the area has interacted with mythology to generate a complex geometry consisting of a circular *pradakshina* route around the Chitrakut hill and a series of interlocking triangles which are linked to the positions of the sun at winter and summer solstices. Triangles in the Chitrakut landscape may be icons for Lord Rama, representing his arrow and bow. We propose that the spatial patterns that are present in the Chitrakut area may be identified as *cosmic* geometries in that they intertwine the three spatial levels of the cosmos: the solstice positions of the sun in the macrocosm; hills, rivers, and caves of the mesocosm; and temples, pilgrimage routes, and ritual of the microcosm (see Dubey and Singh, 1994).

Spatial Purview and Topography

Lying 67 km south-east of Banda and 125 km south-west of Prayaga (Allahabad) (Figs. 1 & 2), the sacred topography of Chitrakut spreads over the two states of Uttar Pradesh and Madhya Pradesh. About one-third of Chitrakut lies in the district of Banda in U.P. and the rest in the district of Satna in M.P. The Chitrakut hill is shared by these two states. The *ghats* and temples of Chitrakut, situated on the bank of the Mandakini river, lie in U.P., whereas a number of holy spots including Gupta Godavari and the hermitage of Atri are in M.P.

The hill of Chitrakut is one of the many hills which form the northernmost spur of the Vindhya mountain. The name Chitrakut (from *chitra*, of various colours, and *kuta*, hill) is said to have been given to it because of the number of different coloured stones found on it. Sedimentary strata of sandstone and limestone in which lava intrusions had later penetrated are represented in these hills. Several types of granites can also be recognized including pink and grey felspar. The *Ramayana* (II. 88. 20-21) describes the hill "as adorned by thousands of blue, yellow, purple and white rocks. At night, the healing herbs shine like fire, lighting the crags with their radiance."

The sacred hill of Chitrakut is also known as Kamadagiri, i.e. 'a hill which grants desires' (Figs. 3 & 4). This epithet of Chitrakut may date to the fifteenth and sixteenth centuries, for Tulasi (1540-1623 AD) has remarked: "Since the time Rama set his feet on this hill, it was turned into a wish-fulfilling one. A simple sight of it is capable of dispelling sorrow and distress" (RcM, II, 279.1). Tulasi describes Chitrakut as a giver of relief from all types of sufferings and as a remover of falsehood, symbolized as a green tree bestowing well-being to any visitor (ViP, 23.1). Its natural scenery and mystic power vanquish all types of ignorance and provide relief from sins (ViP, 24.1). The first glimpse of Chitrakut also gives happiness and purifies the mind, the reason that many ascetics seek shelter there (GV, Ayodhya: 47.1-2).

Historicity and Antiquity

The sanctity of Chitrakut probably goes back to the period 3rd and 4th centuries BC when the *Ramayana* (Rm-V II.50. 13-14) and the *Mahabharata* (MbH III.83. 55-61) were first being written. The region has been praised in a number of *Puranas* (MyP, 22. 65;

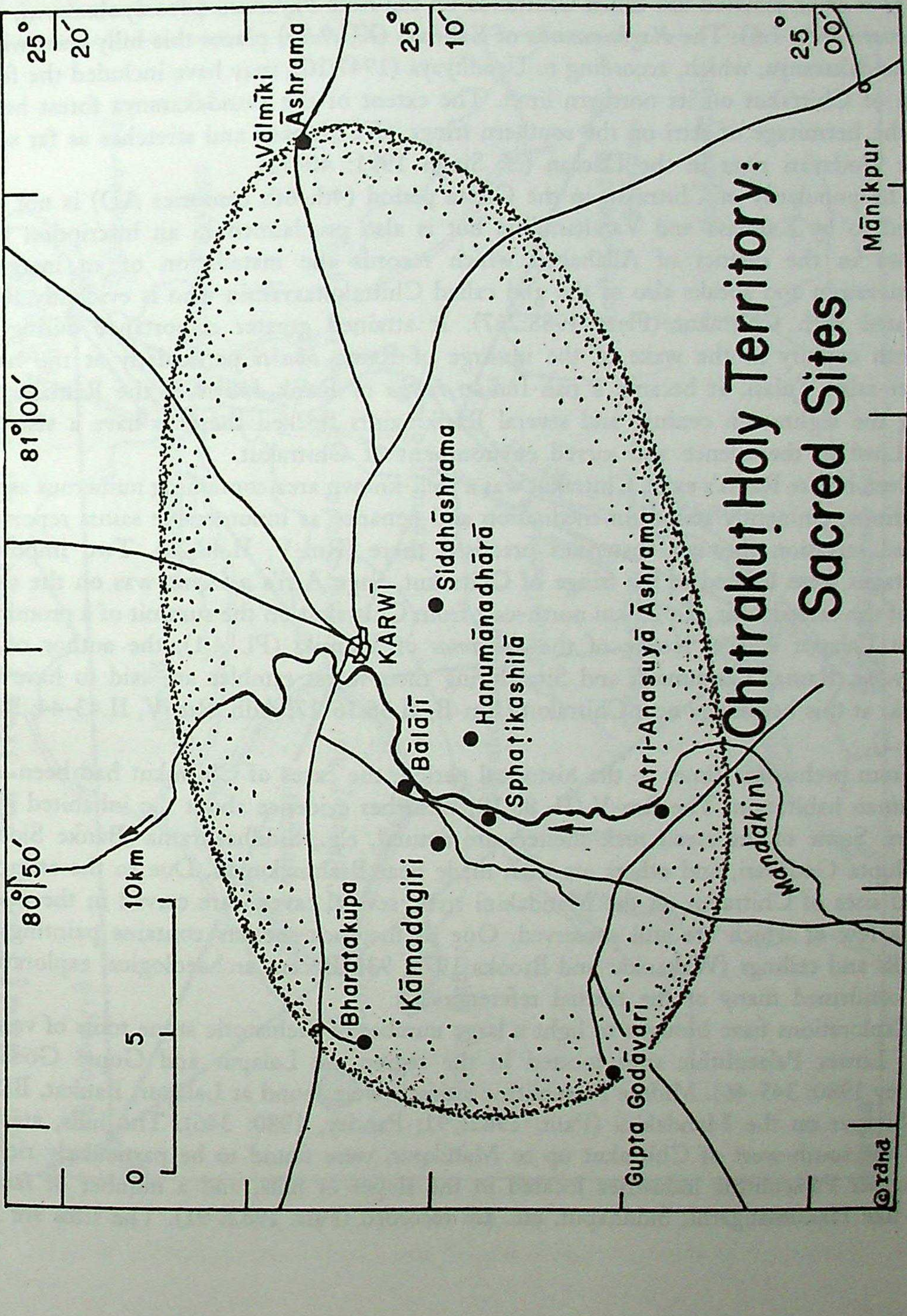

Chitrakuṭ Holy Territory:
Sacred Sites
Vālmīki Āshrama
Mānikpur
KARWĪ
Siddhāshrama
Hanumānadhārā
Sphaṭikashilā
Atri-Anasuyā Āshrama
Bālājī
Kāmadagiri
Bharatakūpa
Gupta Godāvarī
Mandākinī
80° 50′
81° 00′
25° 20′
25° 10′
25° 00′
0
5
10km
©rāna

Fig. 2 Major sites

NaP, I. 79. 18-19 and II.60.23, 75.26; AgP, 6.35-36; PdP, III.39.55-61). The Jaina texts refer to it as an isolated hill called Chittkuda on the river Payasvini (*Avashyakachurni*, 461; *Bhagavati Tika*, 7.6). The *Raghuvamsha* of Kalidasa (XII.9.15) places this hilly tract within the Dandakaranya, which, according to Upadhyaya (1947:10), may have included the forest region of Chitrakut on its northern limit. The extent of the Dandakaranya forest begins with the hermitage of Atri on the southern fringe of Chitrakut and stretches as far south as the Godavari river in the Deccan (cf. Singh 1991: 40-41).

The popularity of Chitrakut in the Gupta period (4th-6th centuries AD) is not only attested to by Kalidasa and Varahamihira but is also proclaimed in an inscription from Gadhwa in the district of Allahabad which records the installation of an image of Anantasvamin and speaks also of the god called Chitrakutasvamin who is evidently Rama associated with Chitrakut (Fleet 1988:267). It attained greater importance during the sixteenth century in the wake of the upsurge of Rama *bhakti* particularly at the hands of poet-saint Tulasi. It became a pan-Indian *tirtha* of Rasik *bhakti* of the Ramaite sect during the eighteenth century and several Rasik saints flocked there to have a vision of their Lord in the silence and sacred environment of Chitrakut.

Even before Rama's exile, Chitrakut was a well-known area containing numerous ascetic habitations, eminently suited for meditation and penance as innumerable saints reportedly attained salvation through austerities practised there (Rm-V, II.48.28). Two important hermitages were located at the fringe of Chitrakut. Sage Atri's *ashrama* was on the south edge of the sacred zone. To 25 km north-east from Chitrakut on the summit of a prominent hill, in Lalapur village, is one of the *ashramas* of Valmiki (Pl. 4.1), the author of the *Ramayana*. Rama, Lakshmana and Sita during their forest rambles are said to have met Valmiki at this hermitage near Chitrakut (Rm-B, II.56.16-17; Adh. Rm-V, II.43-44; RcM, II.124.3).

From prehistoric times to the historical period, the caves of Chitrakut had been used for human habitation. The Rm-V (II. 86.10) furnishes evidence about the inhabited rock-shelters. Some of the area's rock-shelters are natural, e.g., Siddhashrama (Banke Siddha) and Gupta Godavari, and others are man-made near Brahmakunda. Due to the attractive natural sites of Chitrakut on the Mandakini river, several caves were carved in the nearby hills, a few of which are still preserved. One of the rock-shelters contains paintings on its walls and ceilings (Wakankar and Brooks 1976: 93). Recent archaeological explorations have confirmed many of the textual references.

Explorations have brought to light a large number of prehistoric stone tools of various types. Lower Palaeolithic sites located in the region are Lalapur and Gupta Godavari (Pandey 1980: 345-46). Middle Palaeolithic artifacts were found at Lalapur, Bankat, Banari and Sitapur on the Mandakini (Pant, 1982: 91; Pandey, 1980: 346). The hills, starting from the south-west of Chitrakut up to Manikpur, were found to be particularly rich in the upper Palaeolithic industries located in the slopes of hills, and a number of factory sites like Hanumangarhi, Siddhapur, etc. are recorded (Pant 1982: 91). The sites are rich

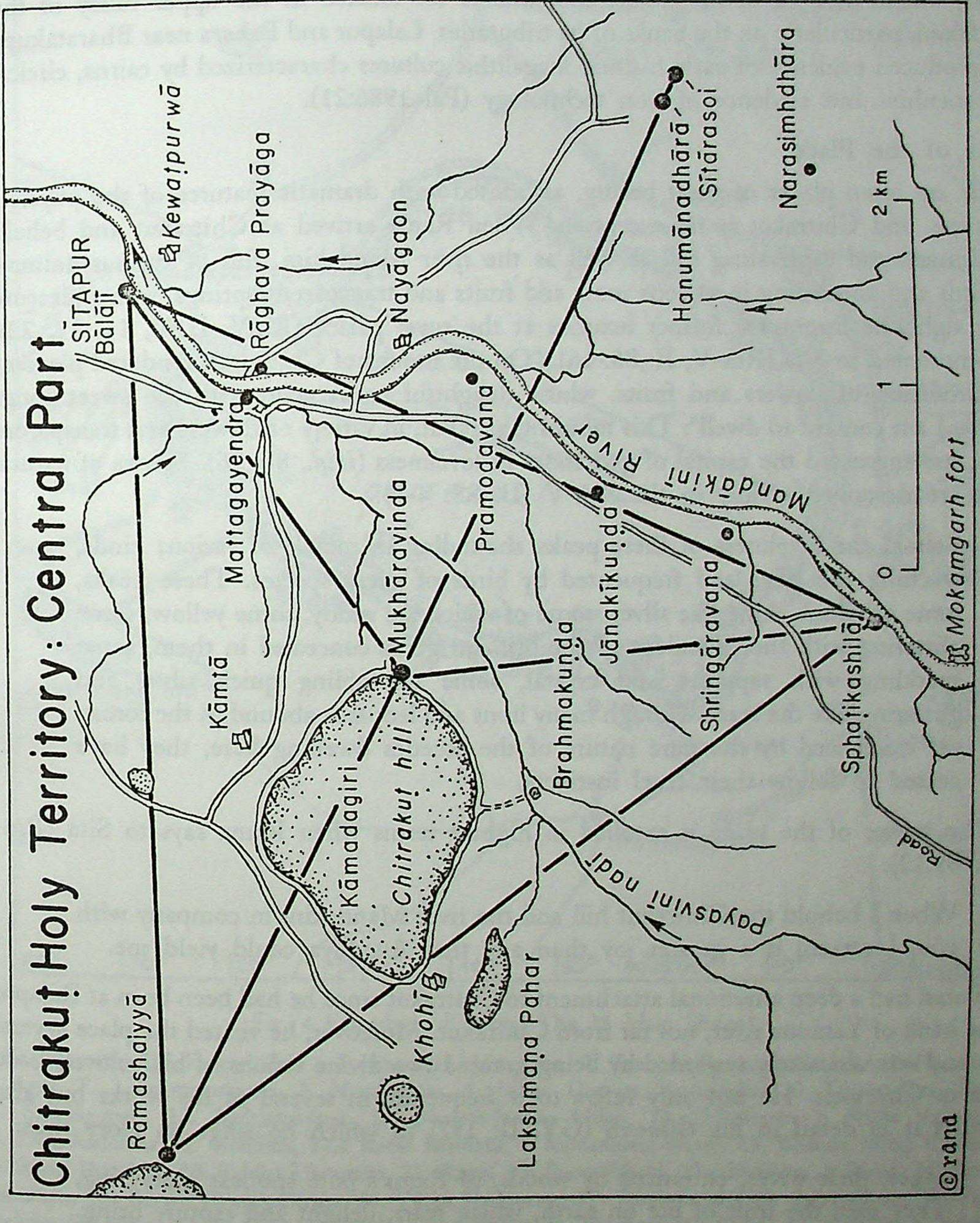

Chitrakuṭ Holy Territory: Central Part
SITAPUR
Bālājī
Kewatpurwā
Rāghava Prayāga
Nayāgaon
Mattagayendra
Kāmtā
Mukhāravinda
Pramodavana
Mandākini River
Hanumānadhārā
Sītārasoi
Narasimhdhāra
2 km
1
0
Mokamgarh fort
Jānakīkunda
Shringāravana
Sphatikashilā
Brahmakunda
Chitrakut hill
Kāmadagiri
Khohi
Payasvini nadi
Road
Lakshmana Pahar
Rāmashaiyyā
©rand

Fig. 3 Central part

in artifacts which were obtained from the lowermost stratum of the rock- shelters at Banke Siddha valley near Siddhapur. A mesolithic site is located at Siddhapur (Sharma IAR 1954-55: 45) and a number of megalithic monuments are located in the upper valley of the Mandakini, particularly on the banks of its tributaries. Lalapur and Pahara near Bharatakupa have produced evidence of early historic megalithic cultures characterized by cairns, circles, cists, menhirs and evidence of iron technology (Pal 1986:21).

Power of the Place

Tirthas are often places of great beauty, associated with dramatic features of the physical landscape, and Chitrakut is no exception. When Rama arrived at Chitrakut and beheld the pleasant and captivating hill as well as the river Mandakini, full of various animals and birds and abounding in various roots and fruits and transparent springs, in his pleasure at the sight, he forgot his former luxuries at the royal palace (RmV, II.50, 11, 12, 22). He commented to Sita (Rm-V, II. 86. 16), "On the mount of Chitrakut, rendered pleasant by a profusion of flowers and fruits, whose delightful peaks echo with the sweet songs of birds, I am content to dwell". This mount Chitrakut, in variety of flowers and transparent waters, has surpassed the capital of god Indra in loveliness (*ibid.*, 88. 26). Scenes of natural beauty are described vividly in the Rm-V (II. 88. 4-7):

> Behold the loveliness of these peaks abounding in metals of various kinds, reaching the skies and frequented by birds of every species. These peaks, some of which shine like silver, some of which are ruddy, some yellow, some glittering with the splendour of the brilliant gems concealed in them, some sparkling with sapphire and crystal, some resembling quick silver and glittering like the stars. Though many lions and leopards abound in the forest, yet influenced by the pure nature of the ascetics dwelling here, they have ceased to follow their cruel instincts.

The power of the place is extolled in highest terms when Rama says to Sita (Rm-V, II. 89.12):

> When I behold the Chitrakut hill and the river Mandakini in company with you, I esteem it a greater joy than any that Ayodhya could yield me.

Tulasi had a deep emotional attachment to Chitrakut since he had been born at Rajapur on the bank of Yamuna river, not far from Chitrakut. Moreover, he visited the place several times and was ultimately rewarded by being granted two divine visions of his beloved Lord Rama in Chitrakut. He not only refers to it frequently in several of his works but also describes it in detail in his *Gitavali* (GV, II. 157) in which he sings its glory thus:

> Sages, their wives, entranced by woods, of Rama's pure spotless glory sing,
> They earn the fruit of life on earth, which tears, delight and rapture bring.
> What words can Chitrakut describe its beauty, wealth, delight and might.
> Tulasi, where Rama, Delight's Abode, dwell with Lakshmana, Sita in sight.

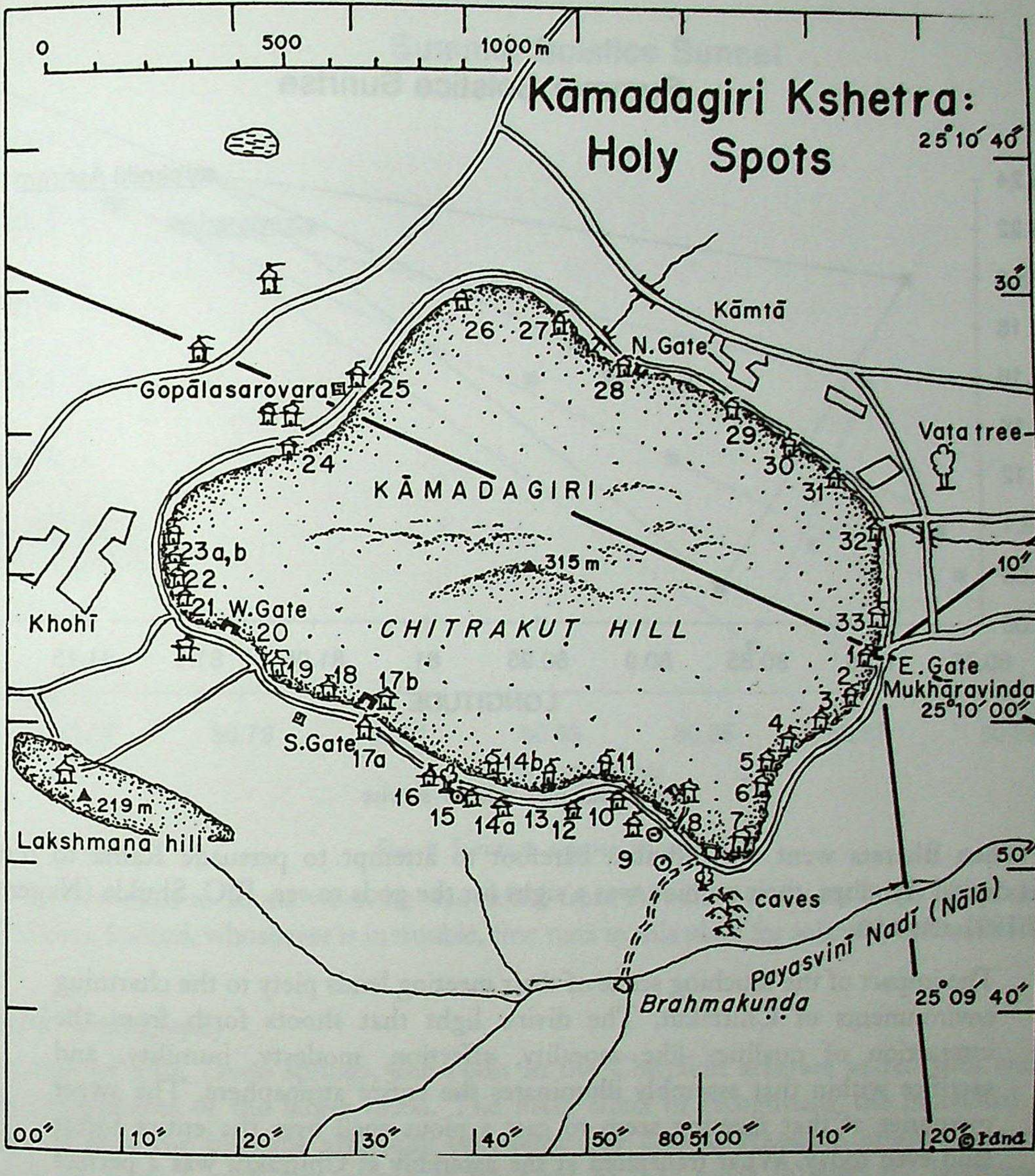

0
500
1000m
Kāmadagiri Kshetra:
Holy Spots
25°10' 40"
30"
Kāmtā
N. Gate
Gopālasarovara
Vata tree
KĀMADAGIRI
315 m
CHITRAKUT HILL
Khohī
W. Gate
E. Gate
Mukhāravinda
25°10' 00"
10"
S. Gate
219 m
Lakshmana hill
caves
Payasvinī Nadī (Nālā)
Brahmakunda
25°09' 40"
50"
1
2
3
4
5
6
7
8
9
10
11
12
13
14a
14b
15
16
17a
17b
18
19
20
21
22
23 a, b
24
25
26
27
28
29
30
31
32
33
00"
10"
20"
30"
40"
50"
80°51' 00"
10"
20"
Rand

Fig. 4 Kamadagiri Kshetra: The 33 Main Shrines

1. Kamadanatha (Mukharavinda), 2. Panchamukhi Hanuman, 3. Vanavasi Rama, 4. Ganesha, 5. Narasimha, 6. Agni, 7. Lakshminarayana, 8. Naraharidas, 9. Sabha Darbara Vashishtha, 10. Dhanurdhari Rama, 11. Sakshigopala, 12. Badrinarayana, 13. Bharata-Janaka Milap, 14.a Hanuman, b Rama Vaikuntha, 15. Dvarakadhisha 16. Sitarama, 17.a Rama Baithaka, b Kamadhenu (cave), 18. Bharata Milap Complex, 19. Rama Jharokha, 20. Siddha Hanuman, 21. Rama, 22. Rama-Janaki, 23.a Harihara, b Rama, 24. Baraha Hanuman, 25. Bavani Dvarakadhisha, 26. Vijaya Hamuman, 27. Rama-Janaki, 28. Sarayudhara, 29. Vijaya Raghava (& Hanuman & Chaitanya Mahaprabhu Baithaka), 30. Jagadisha Rama, 31. Baladau & Bihariji, 32. Kaushalya Milap, and 33. Lakshminarayana.

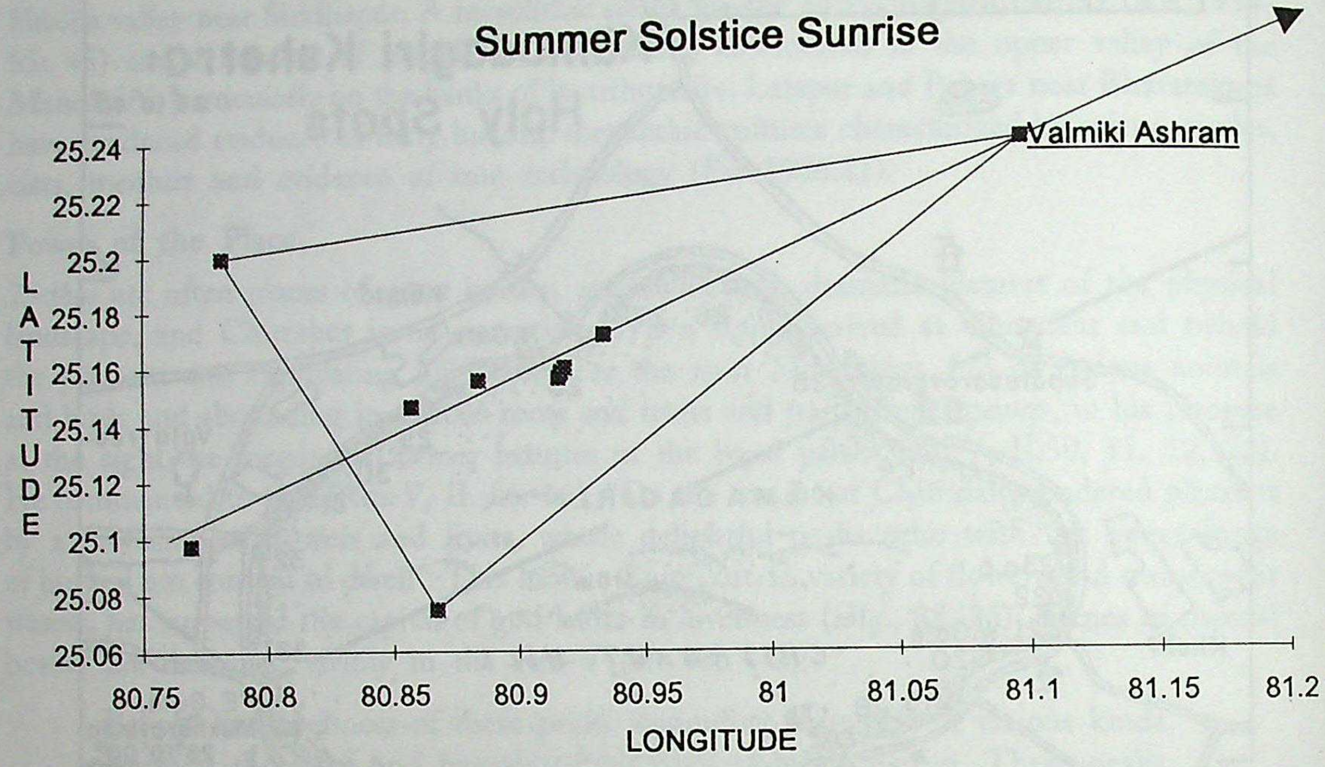


Fig. 5 Summer solstice sunrise

When Bharata went to Chitrakut barefoot to attempt to persuade Rama to return to his capital Ayodhya, their reunion was a sight for the gods to see. R.C. Shukla (Nagendra 1977:199) remarks:

> The impact of the touching scene of their meeting lends piety to the charming environments of Chitrakut. The divine light that shoots forth from the interaction of qualities like morality, affection, modesty, humility, and sacrifice within that assembly illuminates the entire atmosphere. The sweet memories of that meeting seem to cast a pious spell over the entire forest land even today. What transpired at the assembly at Chitrakut was a perfect manifestation of virtue in all its aspects.

The area contains numerous footprints of Rama, and has been called Ramasthana (PdP, V. 36.21), Rama's landscape. Because a visit destroys grief, Chitrakut has been compared to a medicine—the mere sight of which makes one cured: "*Chitrakut ek aushadhi chitavat hota sacheta.*" The famous Hindi poet Rahima, who was also a courtier and army commander of the two emperors Akbar and Jahangir, once fell into disgrace with Jahangir and was banished from the Mughal court. He is said to have come to Chitrakut, living there *incognito* serving a shopkeeper who used to sell parched grain. He has exclaimed that, "Chitrakut

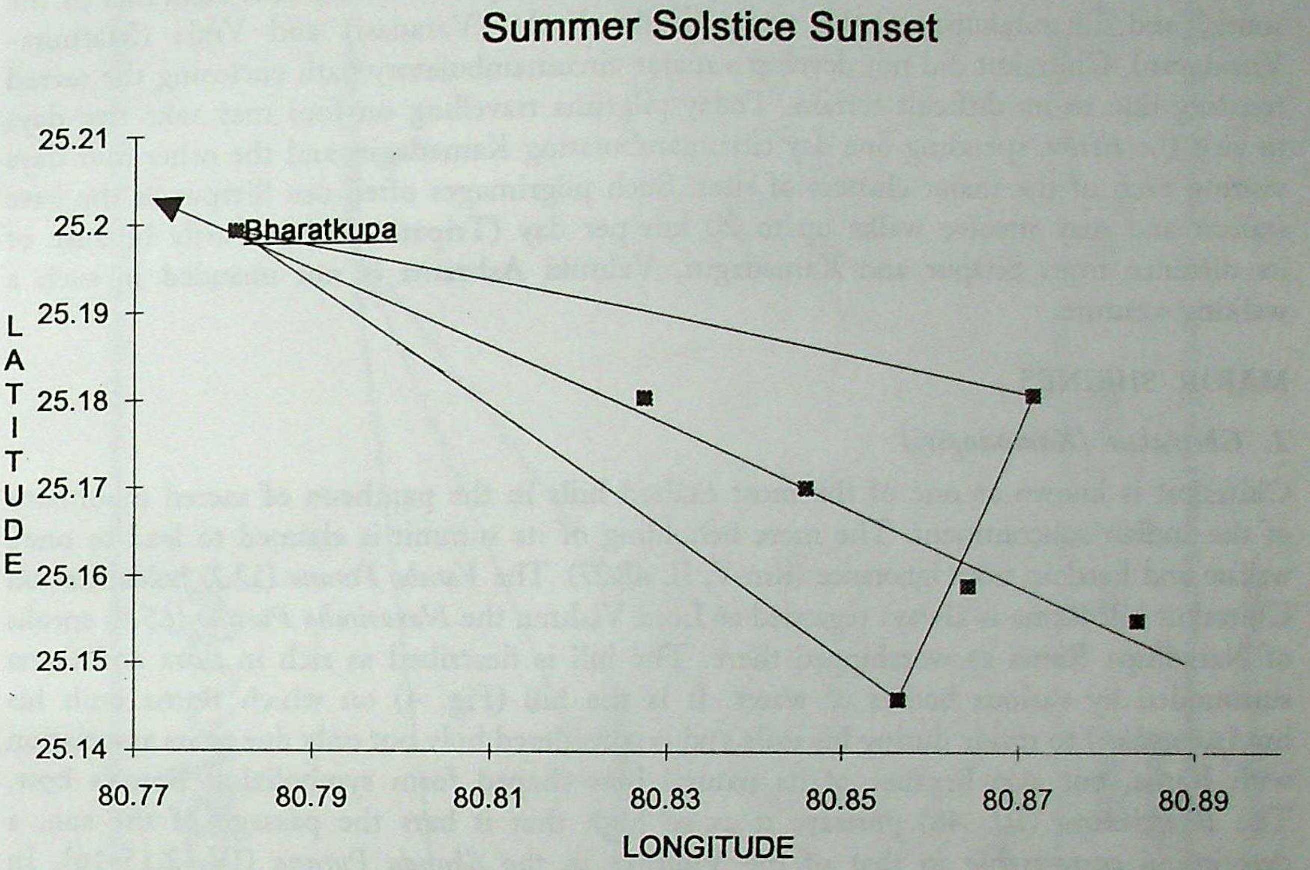


Fig. 6 Summer solstice sunset

once gave shelter to Rama when he was exiled from Ayodhya and now it has given shelter to Rahima. Indeed, whosoever is in trouble, first runs to this place for solace" (*Rahimanavinoda*, 193).

Sacred Topography

A variety of hills, caves, springs, and pools in the Chitrakut area are sacred sites and are thus components of the larger *tirtha*. The main effect of recognizing the individual sub-*tirthas* is that the pilgrims gradually experience the natural grandeur, spiritual meaning, history of Rama's exile, and power of the place as they move through the landscape of Chitrakut. Our recent survey in March 1994, shows that of many of the original holy spots described in the 18th century *Chitrakuta Mahatmya* (CtM, 1881) only 12 sites remain. Seven of these spots, viz. Kotitirtha, Chitrakutagiri, Mandakini, Sphatikashila, Atri Ashrama, Banke Siddha and Bharatakupa are mentioned in early texts and are frequently visited by devout pilgrims who go through the ceremonies of *puja*, bathing, and meditation at each of them. The other five spots, Sitakunda, Devangana, Ramashaiyya, Hanumandhara and Gupta Godavari, are more recent, having attained popularity since the 18th century, mainly due to the CtM eulogy.

Three cardinal points are marked by Banke Siddha in the east, Atri Ashrama in the south, and Bharatakupa in the west. Unlike Kashi (Varanasi) and Vraja (Mathura-Vrindavan), Chitrakut did not develop a major circumambulatory path enclosing the sacred territory due to its difficult terrain. Today pilgrims travelling on foot may take five days to visit the *tirtha*, spending one day circumambulating Kamadagiri and the other four days visiting each of the major clusters of sites. Such pilgrimages often use Sitapur as the base station and may involve walks up to 20 km per day (Tripathi 1990). Partly because of its distance from Sitapur and Kamadagiri, Valmiki Ashrama is not included in such a walking venture.

MAJOR SHRINES

1. Chitrakut (Kamadagiri)

Chitrakut is known as one of the most exalted hills in the pantheon of sacred mountains of the Indian subcontinent. The mere beholding of its summit is claimed to lead to one's welfare and freedom from ignorance (Rm-V, II. 48.27). The *Varaha Purana* (12.2) holds that on Chitrakut hill Rama is always regarded as Lord Vishnu; the *Narasimha Purana* (65.9) speaks of Naradhipa Rama as worshipped there. The hill is described as rich in flora and fauna surrounded by various bodies of water. It is the hill (Fig. 4) on which Rama built his hut (*parnakuti*) to reside during his exile and is considered holy not only due to its association with Rama, but also because of its natural bow-shaped form symbolizing Rama's bow. The *Bhattikavya* (III. 46) portrays it as so high that it bars the passage of the sun, a description comparable to that of the Vindhya in the *Skanda Purana* (IV. 2.15-16). In fact, 315 m height of the rounded hill is insufficient to bar the sun at noon during any day of the year. The *Jatakas* (II. 176, VI. 126) refer to it as a pleasant and spotless place.

Around the base of the hill, a stone-paved pathway was constructed by Chanda Kuwari, a queen of the Bundela chief Chhatrasal in 1725 and was repaired in 1897 by the British government (Dubey 1953:34). The entry point to the *pradakshina* path is Mukharavinda, a temple containing the face of Lord Rama. The spot where Bharata met Rama and was embraced by him lies on the southern portion of encircling path of this hill. The ground at the site, Bharata Milap, is broken and cracked due, according to tradition, to the heat and energy generated by that meeting.

Initially there were 33 shrines (the number has now increased to 56) along the right (the inner edge) of the circumambulatory path. In Hindu mythology the gods are usually stated to be of 33 types, divided according to the three divisions of the universe. Some pilgrims perform the ceremony of *parikrama* around the hill by measuring the circuit by their bodies extended flat on the ground; others simply walk. The ritual of *pradakshina* of the hill dates back to the time of the *Ramayana* which describes the five-day circumambulation by Bharata before leaving for Ayodhya with the sandals of Rama (Rm-V, II. 105.3). According to Kalidasa, the hill looks like a "wild bull playfully butting against a rock" (RaS, XIII. 47). Embodying all that was best and noblest in the world, it was regarded as 'God in an immovable form.'

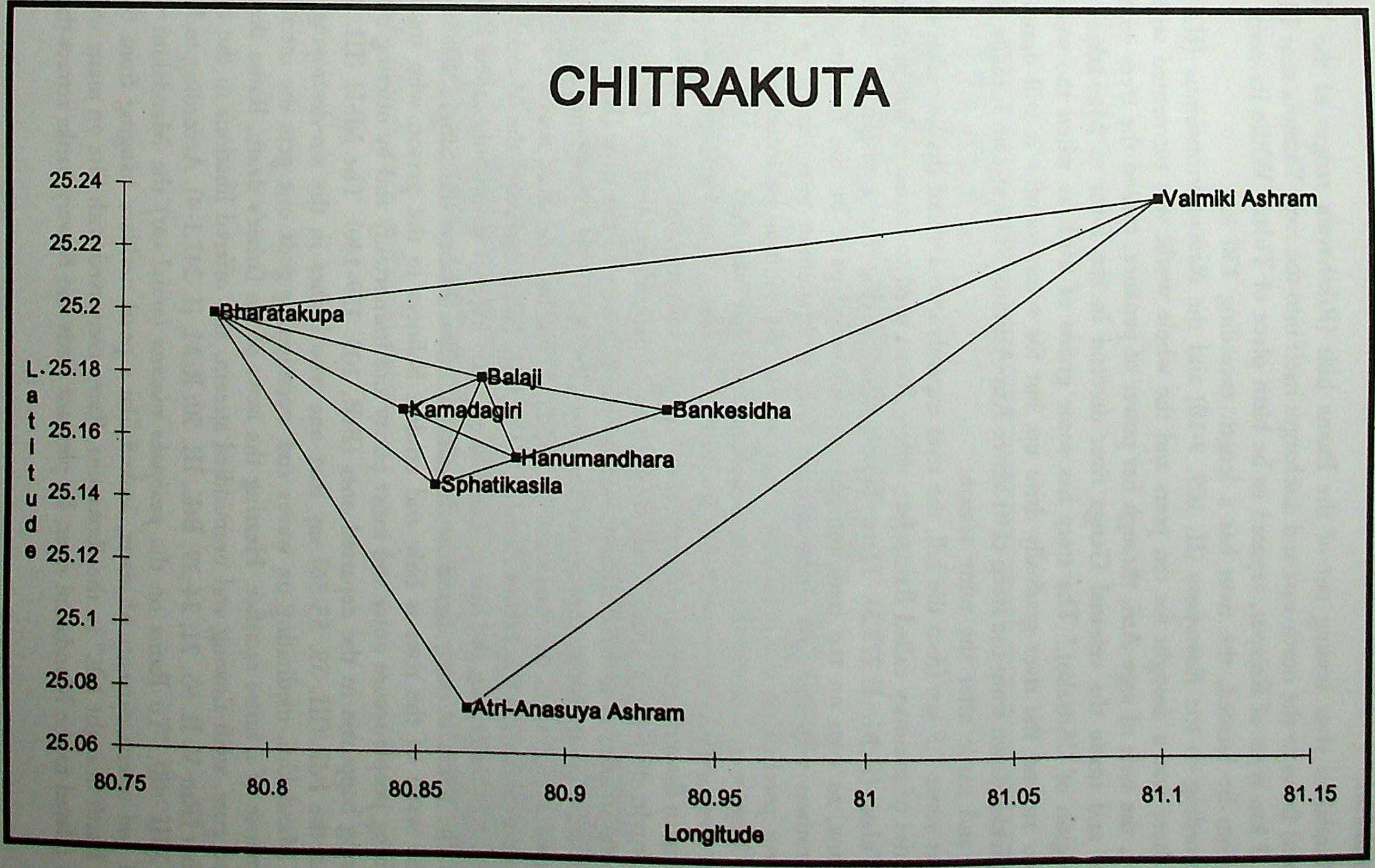


Fig. 7 The Cosmic geometry of Chitrakut

2. *Mandakini*

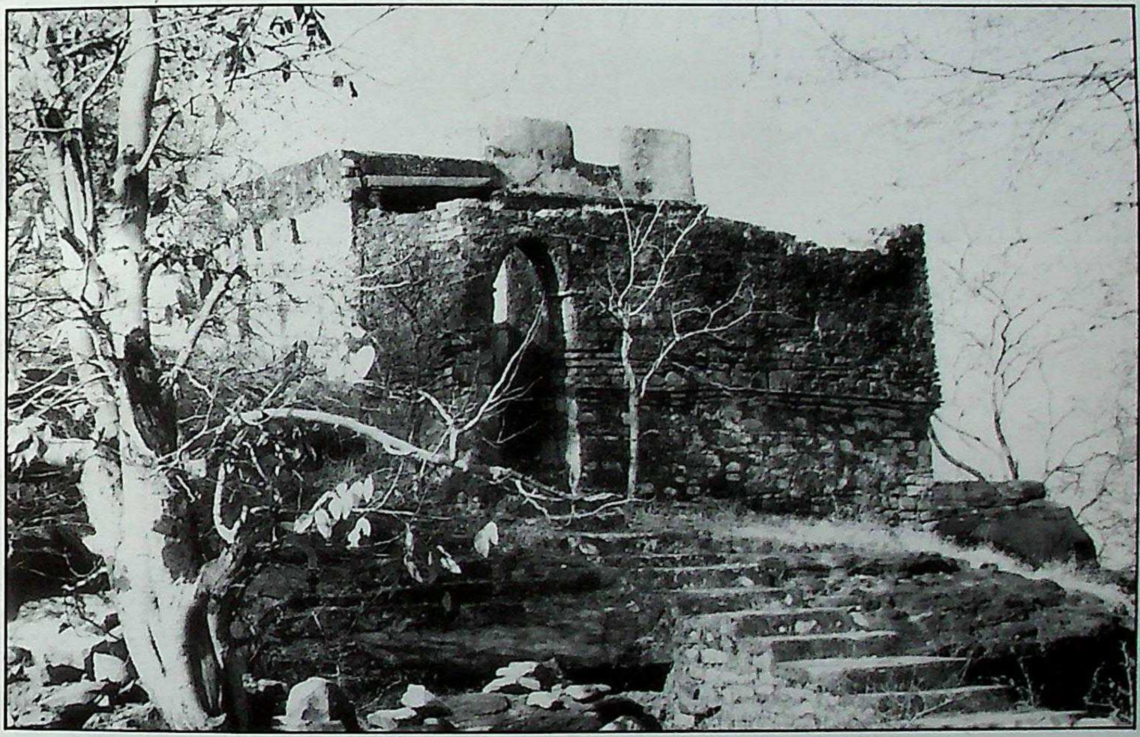
The Mandakini river issuing out of the Panna hills (Rikshavata ranges of the Vindhya mountain) flows to the north-east and discharges itself into the river Yamuna near Bhadedu village, 3 km west of Rajapur, reputed to be birth place of Tulasi. While its exact source can seldom be located, the river has a length exceeding 130 km.

According to the *Ramayana* (II. 109. 9-10) and the *Ramacharitamanasa* (II. 132.3), "Once there was a drought for ten years and the whole world was tormented with heat. Anasuya, the wife of sage Atri, through her power of penance, caused the trees with fruits to grow and made the celestial Ganga river descend in the form of Mandakini in the rocky region of Chitrakut." The story has some grains of truth as when the wet season comes to an end the river gradually dries up, but for some months it still draws water which trickles down from the steep cliffs above Atri-Ashrama. The stream is easily fordable by men and cattle after the rainy season.

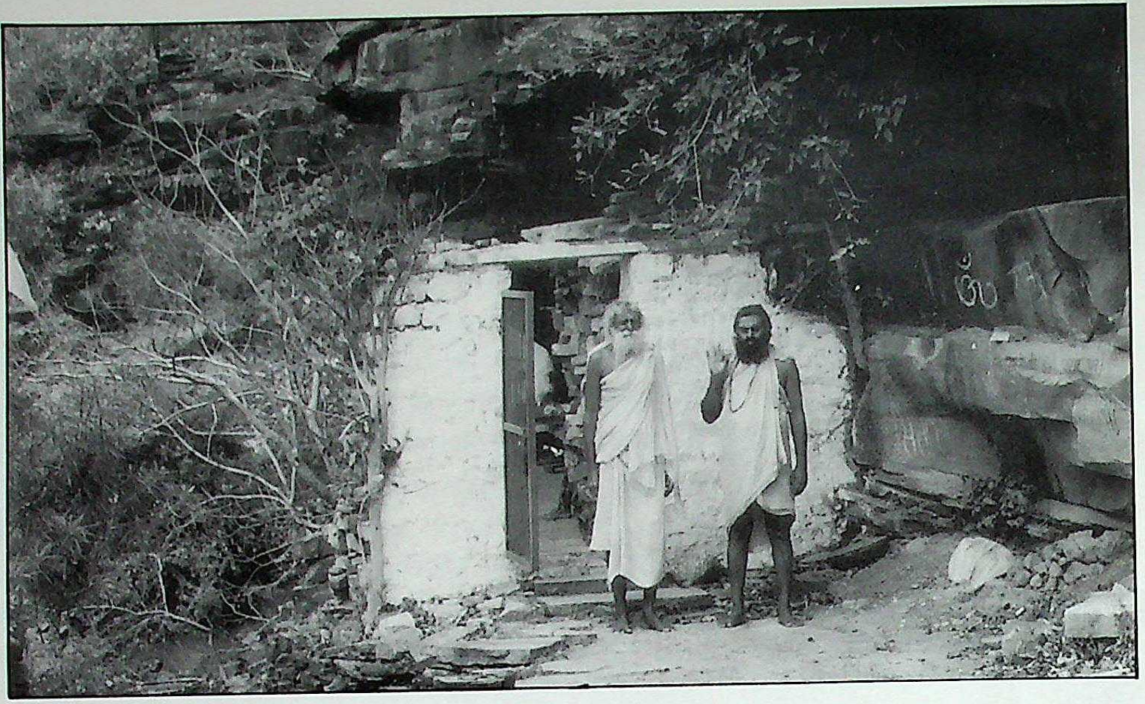
After some 1.5 km from the hill, the river expands into a small shallow lake, enclosed by a border of masonry called Ramaghat, where Rama used to bathe, as has been referred to by Tulasi (RcM, II.277.3). Here Tulasi, after praying for a vision of Rama and Lakshmana, so goes on the tradition, placed sandalwood paste on the foreheads of two young brothers who had just emerged from bathing. Hanuman was present in the form of a parrot perched on the branch of a nearby tree. As soon as he informed Tulasi that the two boys were actually Rama and Lakshmana, they vanished.

The river with its attractive banks frequented by swans, cranes and other water-fowls, abounding in flowering trees of different kinds on the banks resembles the river Saugandhika in the region of Kubera (Rm-V, II. 89.4). The blossoms scattered by the force of the wind make it seem as if the Chitrakut were offering flowers to the river (Rm-V, II. 89.8). Flowers grow on its banks throughout the year (Rm-V. II, 89.18). Hence it has rightly been called Malyavati in the *Ramayana* (II.50.22). Tulasi has portrayed it as a female florist (Mandakini-malini) in the *Vinaya Patrika* (ViP, 23.3). Tulasi compares the Mandakini with the Ganga coming from the hair of Lord Shiva. This river is commonly called Payasvini, though the name is rarely found in the ancient texts (Dubey and Singh, 1994: 320).

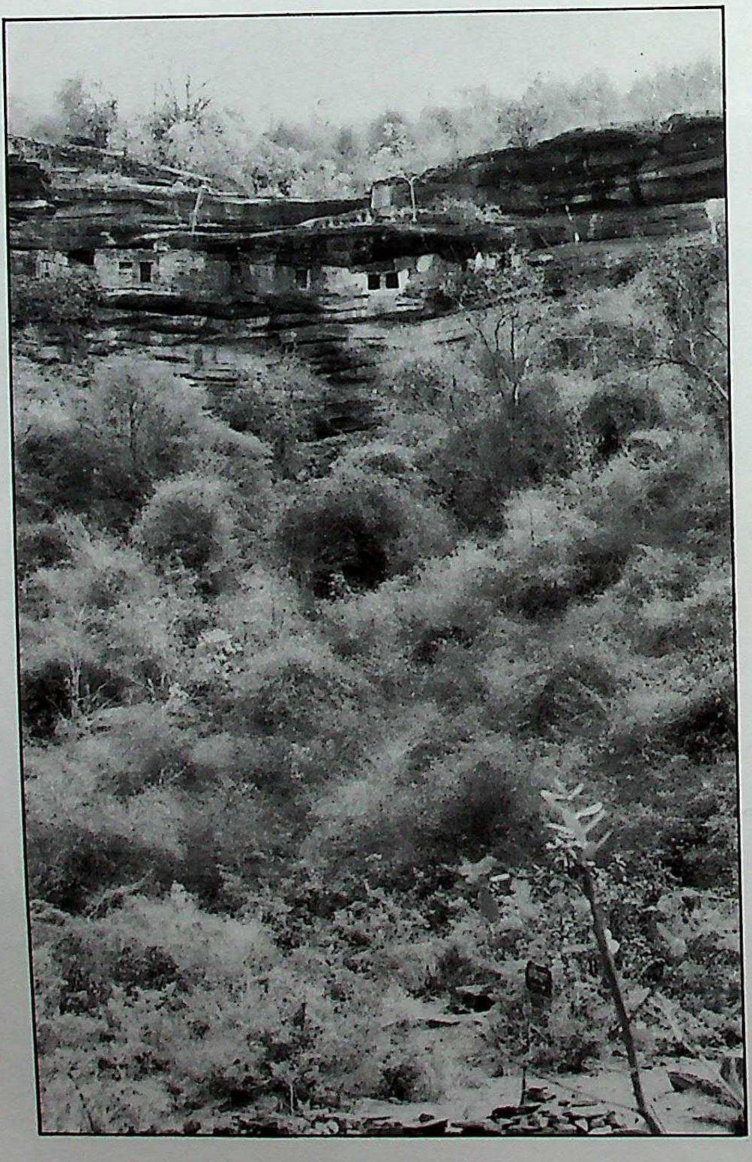
The water of the river is holy and renders holiness to the person who touches it. By bathing people secure outer and inner purity and immortality and by offering oblations they bring happiness to the departed ones (BsR, 103. 139-140). The MbH (III. 83. 55-56) and the PdP (III. 39. 55-56) say that one who bathes in the sin-destroying waters of the Mandakini, meditating on waves and worshipping gods one gets the merit of the performance of a horse sacrifice. Hearing the news of his father's death, Rama descended into the pure, swift-flowing and unmuddied stream, and offered libations in the name of his father (Rm-V, II. 95, 21, 24-29; BtK, III. 50; RcM, II. 247.1-4). According to Kalidasa (RaS, XIII. 48), "To Rama on the *pushpaka vimana* (aerial car) the Mandakini with its limpid and serene currents of water, looked like a pearl necklace hanging from the neck of the Earth near the hill." In the *Ramayana*, Rama conversed with Sita on many wondrous things related to the Mandakini river. Its pleasant fords and flowery banks attract the heart:



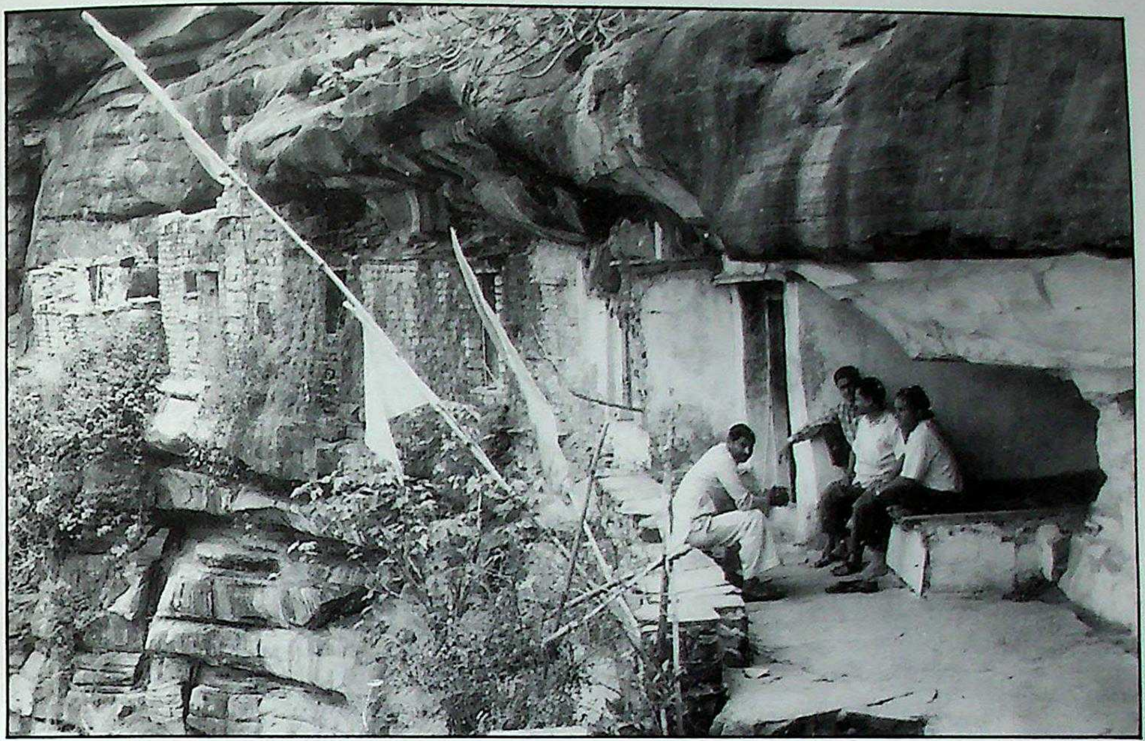
Pl. 4.1 A scene of Valmiki Ashram



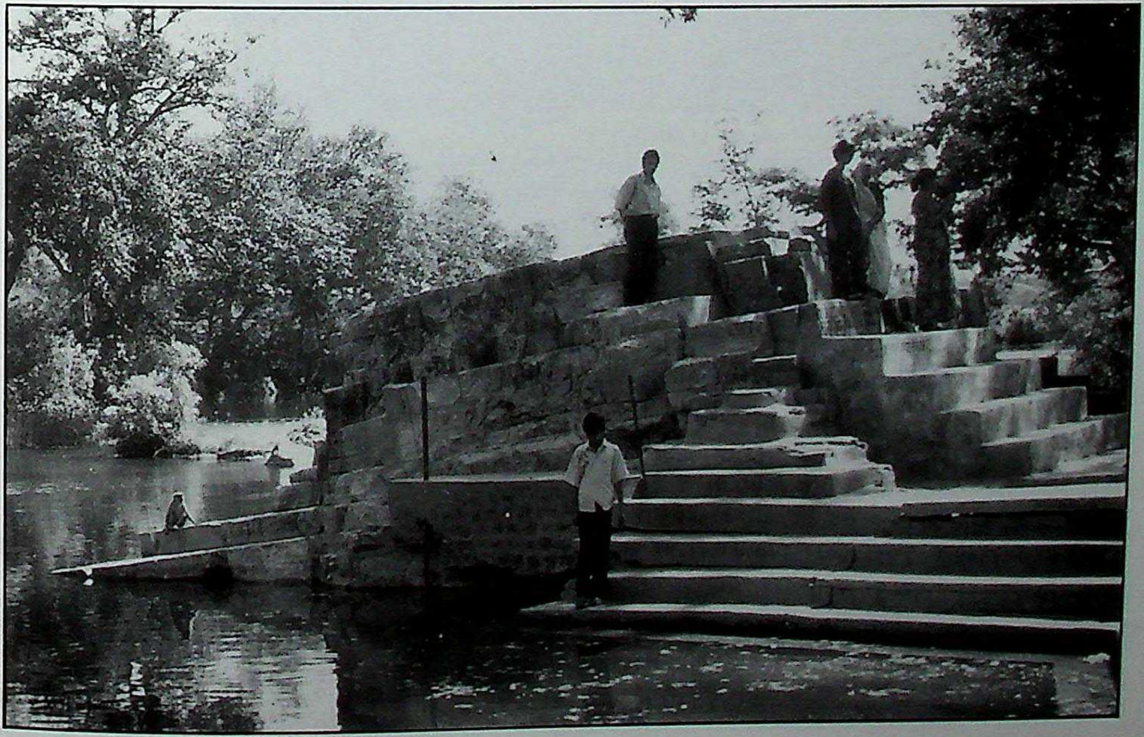
Pl. 4.2 A view of Kotitirtha



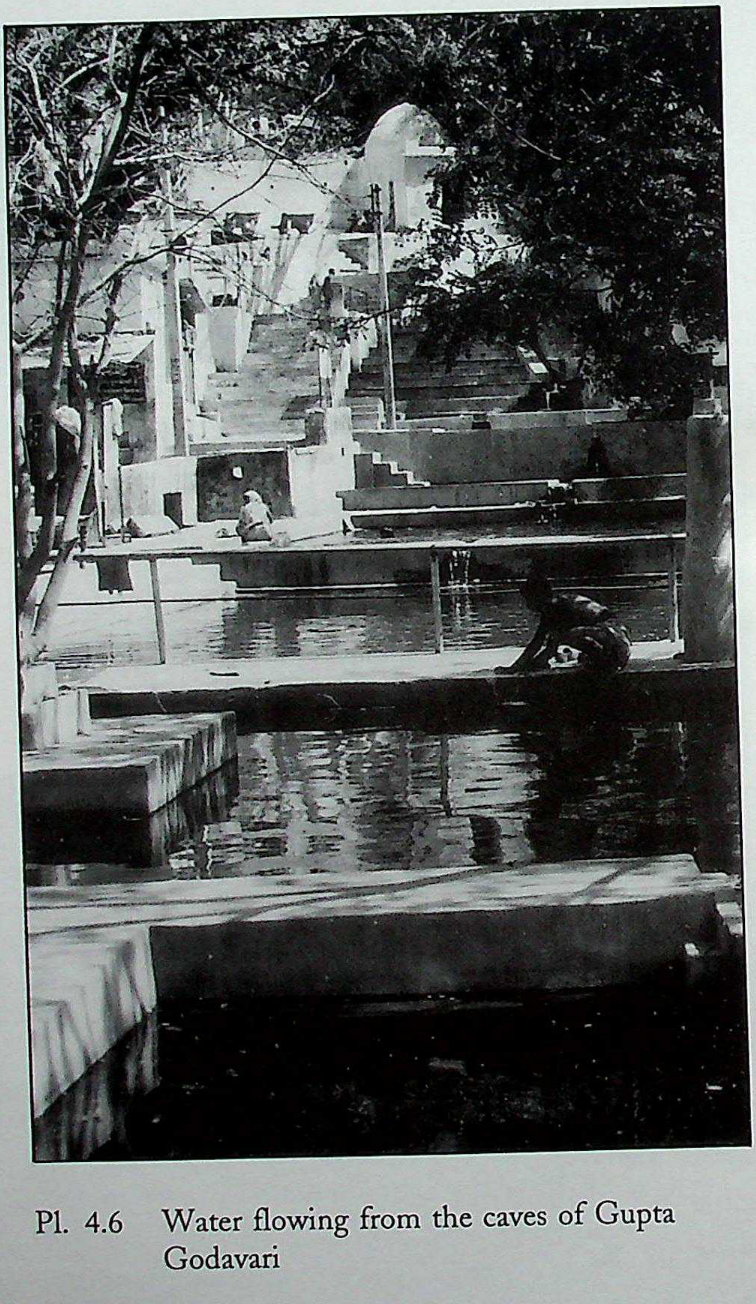
Pl. 4.3 A view of Siddhashram



Pl. 4.4 A close view of the entrance of Siddhashram



Pl. 4.5 Sphatikashila



Pl. 4.6 Water flowing from the caves of Gupta Godavari

"Here the waters of Mandakini sparkle like gems and there they form a sandy beach. Groups of perfect beings frequent the banks" (Rm-V, II. 89.9). The ascetics bathe at stated times in this river. "Here the sages observing strict and austere vows, stand with uplifted arms, worshipping the sun" (Rm-V, II. 89.6-7).

3. *Kotitirtha* (Pl. 4.2)

This picturesque and wild spot lies about 7 km to the east of Chitrakut hill. It is located on the hill called Samkarshana where a number of sages are said to have performed penances. It is characterized by lush green trees and numerous clear water springs forming *kundas*. It is mentioned in the MbH (III. 83.58), PdP (III, 39.57) and CtM (2.29, 12.8-13, 15) only. According to the MbH and PdP, bathing here accrues the merit of the gift of 1,000 cows, and its circumambulation leads the devotees to the attainment of *Shivaloka* (the abode of Lord Shiva).

4. *Siddhashrama* (Pls. 4.3 & 4.4)

Two km north-east of Kotitirtha is Siddhashrama now known as Banke Siddha, lying at the head of a triangular valley enclosed by two hill ranges from three sides with an opening towards the north-east. The remote site consists of a large natural cave 100 m above the valley floor, which is reached by 252 steps. It is called Bhartristhana and Guhasthana in the MbH (III. 83.57) and the PdP (III. 39. 58), respectively which make it sacred to god Mahasena (Karttikeya). But the CtM (12.20-21) names it as Siddhashrama sacred to Shiva in his yogi form. A mere visit to it is capable of granting the desire, hence the name Siddhashrama (MbH, III. 39. 58; PdP, III. 39.21). The cave was the home of a celebrated saint or *siddha* who was asked by the gods to check on welfare of Rama, Sita, and Lakshmana during their exile. The *siddha* declined the request saying that because of his own good deeds he deserved to be visited by Lord Rama, not the other way around, and eventually Rama paid him a visit. A spring emerges from the rock just above the cave.

5. *Hanumandhara*

A perpetual stream falls on a large image of Hanuman carved in the high cliff at a distance of 3.8 km in the east of Chitrakut. The dramatically located shrine is approached by a zigzag series of 360 steps. The spring called Patala Ganga falls on the left arm of Hanuman. After he had set fire to Lanka, Hanuman had been unable to cool himself and came to the spring of Patala Ganga where he obtained relief. Here we encounter the explicit juxtaposition of symbols of fire and water. Not mentioned in early texts, it is first noticed in the CtM (2.30, 12.28-31). The summit of the hill contains Sitarasoi where Sita reputedly prepared food for Rama and Lakshmana.

6. *Sphatikashila* (Pl. 4.5)

Lying 2.1 km south of Chitrakut, this picturesque rock of yellowish colour limestone on the Mandakini was where Rama and Sita used to sit and behold the scenic beauty of the place. The footprints of Rama are reputedly visible on this rock. There Rama is believed to have plucked out with an arrow one of the eyes of Jayanta who, in the guise of a crow, dared peck at the foot of Sita (AgP, 6.36; RcM, III. 1.2; CtM, 13.4-5). Nearby it to the north, is Sitakunda which is believed to have been sanctified by Sita's ablutions (CtM, 13.2-5).

7. *Atri-Anasuya Ashrama*

Situated about 8 km south of Chitrakut, on the left bank of Atri-Anasuya Ashrama is a place of extraordinary natural beauty the Mandakini at the foot of a hill amidst a dense forest containing numerous springs. Rama visited the spot on his way to the Sharabhanga Ashrama (Rm-V, II. 109. 5-6; BtK, IV. 1; RaS, XIII. 50-52; RcM, II. 3-5; AgP, 7.1; BsR, 103. 39-40; CtM, 2.30, 13.9). At the foot of the hill, the temples of Anasuya, Atri and Hanuman are situated. The river Mandakini oozes out from this hill. It was there that Sita was taught the ideals of faithfulness towards one's husband by Anasuya, the foremost of the pious wives of antiquity. Dattatreya, Durvasa and Chandra are described in the Puranas (SkP, V. 3. 169 ff) as the sons of Atri and Anasuya, who compelled Visnu, Shiva and Brahma, to assume human form. There are on a large basalt rock two inscriptions, one dated Samvat 1520 (AD 1463) and the other undated but apparently of the same age.

8. *Gupta Godavari* (Pl. 4.6)

This site consists of two major limestone caves situated on a hillock, 10.3 km south-west from Chitrakut. The first cave has a wide and spacious interior, whereas the second one is narrow with a stream perpetually gushing out of the crevices at the end of the serpentine tunnel. The water coming out of the caves comes together in the form of a stream which disappears underground. A long inscription in the Devanagari script of Samvat 1811 (AD 1754) is found at the entrance of the second cave. This spot is mentioned in the CtM (2.32, 13.40-42) for the first time. The presiding deity there is Shiva; a *linga* was installed in the reign of king Aman Singh there according to the inscription referred to above. The higher cave contains a black stone (known as Khat-khata Chora, corresponding to the sound made by shaking the rock) hanging loosely in its ceiling which can be pushed up and down by a bamboo pole. According to tradition, the stone was originally a thief who tried to steal the clothes of Sita; he shall continue hanging upside down until the current *yuga* ends.

9. *Bharatakupa*

At a distance of 7.7 km from Chitrakut, the great well of Bharatakupa is said to contain the waters of all the holy rivers of India brought by Bharata to celebrate the coronation ceremony of Rama (RcM, II.309-310; CtM, 14.29-34). The MbH (III.83.59-61), the PdP (III.39.59-61) and the BsR (103.141) refer it as Jyeshthasthana, sacred to Shiva, where a well named Chatuh Samudrika exists. However, the BsR names it as Shreshthasthana. Ablutions and worship of Shiva are highly meritorious there. The well possibly got the name of Bharatakupa during the 15th-16th centuries, for Tulasi (RcM, II.310.1-4) has said:

> People will now call it by the name of Bharatakupa (a well sacred to the memory of Bharata). Its sanctity has been enhanced because waters from all holy places have been mixed into it. People who take a plunge into it with devotion and with due ceremony will become pure in thought, word and deed.

Patterns in the Landscape

The natural landscape contains three series of sub-*tirthas* each of which establishes an isosceles triangle. Because of the special relationship between Rama and the region of Chitrakut, these pilgrimage triangles may represent the arrow and bow that often identify Rama and Laksmana in iconography. The triangles are oriented toward the solstice sun, an important symbolism for Rama and Laksmana, sons of the solar dynasty of Ayodhya.

The arrow that bisects the largest triangle is established by eight sites, extending more than 30 km south-east from Valmiki Ashrama to Gupta Godavari. Looking toward Valmiki Ashrama, the regression line (Fig. 5) has an azimuth of 63.5°. Although these are primarily natural sites, the chances that the linear arrangement of these eight sub-*tirthas* is coincidental is less than one part in ten thousand. The arrow aligns with the direction of sunrise on June 21 which on a flat horizon in the Chitrakut area occurs at an azimuth of approximately 64°. As viewed from a point on the line, the sun at summer solstice rises close to the hill containing Valmiki Ashrama on the north-eastern horizon. There are also some remarkable symmetries in the geometrical pattern. The arrow extending from Valmiki Ashrama to Hanumandhara bisects the angle formed by Bharatakupa, Valmiki Ashrama, and Atri Ashrama (Fig. 7) into angles of 13.9° and 14.4°. The two long sides of the triangle, Valmiki Ashrama to Atri Ashrama and Bharatakupa, are 29.4 km and 32.15 km in length, respectively.

The second line of sub-*tirthas* extends from Bharatakupa to Hanumandhara. The regression line (Fig. 6) of the five points has an azimuth of 296.2°. The "arrow" of that triangle is in line with the sun when it sets at summer solstice, which on a flat horizon occurs at an azimuth of approximately 296°. The two solstice lines intersect close to Hanumandhara such that an observer standing on the summit of the hill at Sitarasoi (the kitchen of Sita) would see the sun at summer solstice rise in the vicinity of Valmiki Ashrama and set above Kamadagiri hill, two very important hills of the territory. Because of symmetry, the sun at winter solstice rises along that line at an azimuth of 116°. This second isosceles triangle is also remarkable in its symmetries. Two sides have lengths of 9.3 km and 9.6 km. The line from Bharatakupa to Hanumandhara bisects the central angle to better than 1%, i.e., the line to Balaji is 11.66° to the north and to Sphatikashila is 11.45° to the south.

At the smallest level, a third isosceles triangle is formed by Kamadagiri, Balaji and Sphatikashila; the longest sides have lengths of 2.4 km and 2.7 km respectively. The astronomical alignments are not as accurate as the larger triangles, but an individual on the summit of Kamadagiri would see the summer solstice sun rise near Balaji and the winter solstice sun rise near Hanumandhara-Sitarasoi.

These three interlocking triangles (Fig. 7) may be understood to be homologous to the three levels of the cosmos, i.e., heaven, earth, and netherworlds, parallel to the macrocosm, mesocosm, and microcosm. With these icons of Lord Rama embedded in the landscape, with the support of his devotee Hanuman, Rama is ready to provide power of peace and satisfaction, destroying ignorance for those who are ready to realize the natural mystic power preserved at this place. A similar use of triangles is found in other territories associated with Lord Rama such as Vijayanagara (Malville 1994). There one finds similar, explicit icons of Rama at Laksmanabana (Laksmana's arrow) and Kodandarama (Rama's bow), together with a similar alignment toward the position of sunrise near the date of *makara samkranti*.

Concluding Remarks

The richly symbolic and geographically complex landscape of Chitrakut contains the horizon sun at solstices, sacred topography of the mesocosm, and a microcosm associated with Lord Rama and other deities and saints of India. Not the power of kings but the efforts of countless pilgrims have created and maintained the traditions of this *tirtha*. The majority of the sites contain symbols of water and sun. Fire and water, associated with the heat of Hanuman and the destruction of Lanka, are spectacularly displayed on the high cliff of Hanumandhara. Water and the underworld are juxtaposed in the deep caverns of Gupta Godavari.

The "spiritual magnetism" of pilgrimage sites is often linked to unique and dramatic geographic features such as high mountains, deep canyons, or major rivers (Morinis 1992; Preston 1992). Chitrakut contains hills, beautifully wooded areas, and water courses. But perhaps most unique to the area are the interlocking triangles of the sub-*tirthas*. Since most of these are established by the natural topography, the geometrical order and spatial symmetries of these Rama-icons are remarkable. Could the sites that comprise the arrow and bow pattern have been initially chosen with such a design in mind or were these patterns discovered later and reinforced through continued visitation by pilgrims? We are reminded of Eliade's comment that the sacred is never intentionally chosen, but "...in some way or another reveals itself..." (Eliade 1963).

The individual sites in the Chitrakut area are marked by "symbolic redundancy," containing multiple layers of meaning, combining geography, local traditions, and epic mythology. Besides expressive of the arrow and bow of Lord Rama, the patterns of landscape and pilgrimage consist of cosmological geometries which synthesize the three levels of the cosmos. There must have been a gradual evolution and enrichment of pilgrimage traditions as the full symbolic potential of its landscape became revealed through generations of pilgrims.

ACKNOWLEDGEMENTS

The research described herein was performed as part of the project proposed by Malville "Sacred Urban Geometries of India" approved by the Government of India, Ministry of Human Resource Development (No. F.22-58/93-U.4). Dr. Pradeep Mehendiratta of the American Institute for Indian Studies greatly facilitated the approval process. We thank David Robertson for the loan of his Garmin GPS 75 receiver. Suryamani Pathak provided kind hospitality and assistance during our fieldwork.

V

KASHI AS COSMOGRAM: SACRED GEOMETRY OF VARANASI

Rana P.B. Singh

Introduction and Outlook

In the Oriental world, the city often grew to become an ordered, territorial organization, expressive of the order and unity of the macrocosm. Many cities thus became cosmograms, magico-spatial geometrical designs which combine the macrocosmos, mesocosmos, and microcosmos, with well-defined symmetries, centres, and peripheries. The basic frame of the cosmogram consists of three parts representing three elements: the circle (*light*), the square (*water*), and the triangle (*wind*). In a numerical context, the square indicates nine planets, the circle indicates four directions and the triangle represents the three mythic realms. In its geonumeric integration, the cosmogram achieves the number 108 (9 x 4 x 3).

The principles and processes of city planning and landscape formation were once able provide, in a substantive manner, to provide inhabitants a harmony contained within spatially limited, marginally productive habitats, where spiritual territorial human constructs were transformed to provide a meaning for man in the cosmos (Singh 1990:2). Although true to a limited extent today, in the pre-industrial cities of the world, cosmology and city planning were often inseparable: "Metaphysical ideology based on cosmological principles was once a dominant force shaping the cultural landscape" (Nemeth 1987:3). This was man's revelation for a "rediscovery of the dialectic nature of wholeness" in the realm of humanness, where "nature, cosmos, and humanity form a whole and that whole means holy" (Buttimer 1989:263).

If the idea of architecture is to be used as "planned human construction," the designing of a city is essentially a specific transformation of human creativity, often interpreted in the context of signs and symbols and the invisible meaning preserved there. The presentation of wholeness—the representation of cosmos—leads to form a sacred geometry referring to the spiritual and archetypal dimensions of pattern/relationship, order/sequences and temporality/changes. This frame forms a harmonic and sensual bondage between man and his habitat, the city. In Asia, "Sacred schemata and meaning are most important ones,

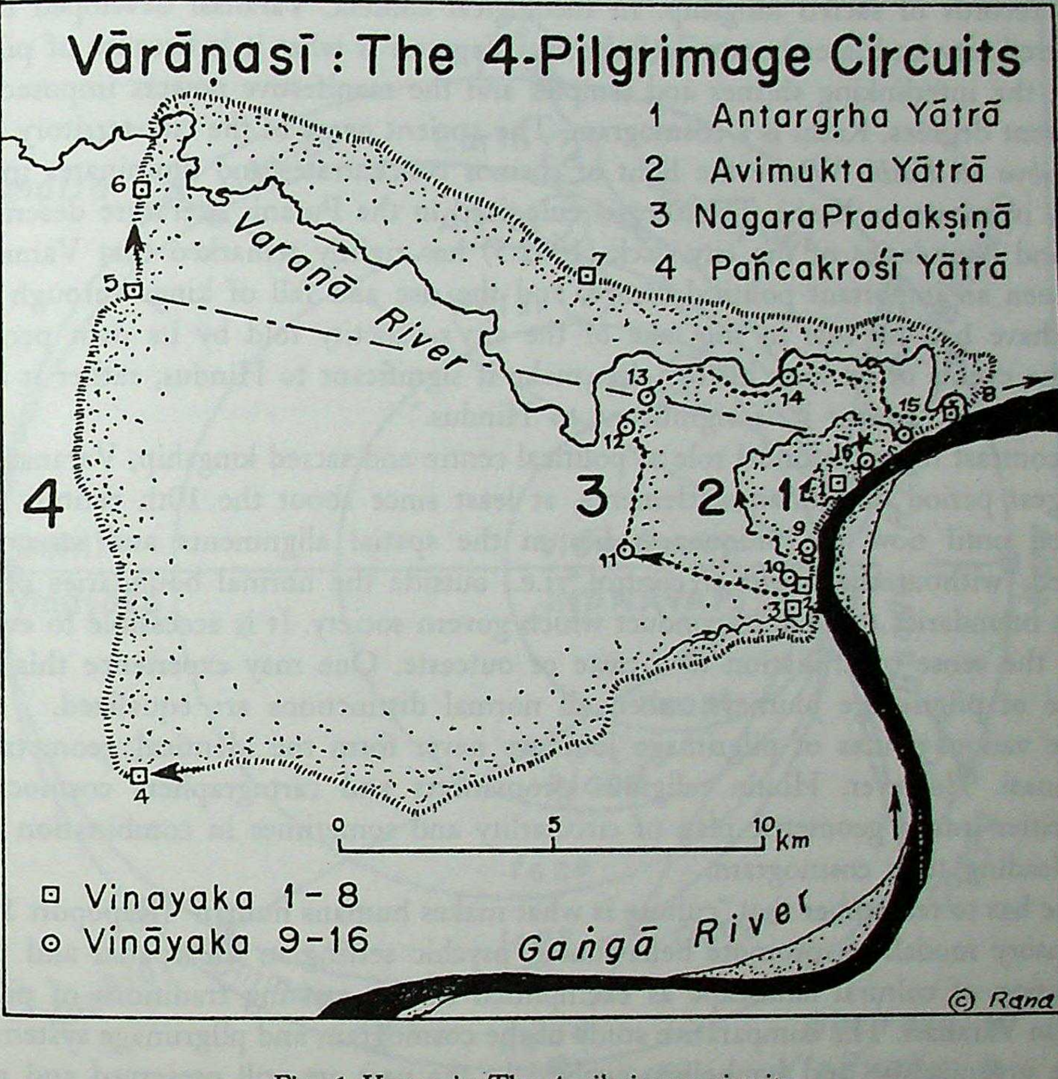

Vārāṇasī : The 4-Pilgrimage Circuits
1 Antargṛha Yātrā
2 Avimukta Yātrā
3 NagaraPradakṣiṇā
4 Pañcakrośī Yātrā
Varaṇā River
Gaṅgā River
4
3
2
1
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
0
5
10 km
□ Vinayaka 1-8
○ Vināyaka 9-16
© Rana

Fig. 1 Varanasi: The 4-pilgrimage circuits

and cities in those cultures can be understood only in such terms" (Rapoport 1990:28). Denny (1991:ix) also described the sacred city in terms of cosmology, "A city can be sacralized by the laying out of its plan according to the cosmology of the region, thus uniting realm and ruler in a pattern of sacred kingship." Yet there are many ceremonial centres that possess potent qualities of cosmic orientation without sacred kingship or an intentional foundation ideology. However, they are considered as the most sacred centres. Varanasi is one of the most potent and well accepted sacred cities in the latter context.

Describing the sacred structure of cities, Meyer (1991:149, 157, 170) proposes two groups: (1) the *cosmocized sacred city*, which records orientation in space and its alignment with the geometry of the universe, where the cosmic axes cross in the centre of the city, and (2) the *holy city of local sacrality*, recording religious meaning and organizing space according to a sacred model like pilgrimage routes and associated shrines. Varanasi (Banaras), in Meyer's scheme, does not fit fully as the city of the first group because it has no records of sacred kingship. In theological context, Varanasi developed originally as a sacred city and later became a holy city. Varanasi is what it is because of pilgrimage circuits, the interlinking shrines and temples and the manifestive powers imposed therein at different degrees. Kashi is a cosmogram. The ancient name of the city-territory is Kashi, i.e., *Kashya eti Kashi*. Where the light of cosmos concentrates and illuminates in circular territory is known as Kashi. This idea is eulogized in the Puranic literature describing the limits and boundaries of the city. Eck (1982:5) has rightly remarked that Varanasi "has rarely been an important political centre, and the rise and fall of kings through its long history have had no role in the take of the city's sanctity told by its own people.... It is not the events of its long history that make it significant to Hindus; rather it has such a long history... *because* it is significant to Hindus."

In contrast to its historical role as political centre and sacred kingship, Varanasi records the longest period of human settlements, at least since about the 10th century BC and continued until now. Its uniqueness lies in the spatial alignments and structure that developed "without the world of control," i.e., outside the normal boundaries of spatial-religious boundaries or code of conduct which govern society. It is accessible to everybody, without the sense of affiliation to a caste or outcaste. One may experience this sense at the time of pilgrimage journeys, when all normal distinctions are equalized.

The various routes of pilgrimage journeys never form the identical geometric shape in Varanasi. However, Hindu religious geomancers and cartographers cosmocized the irregularities into a geometric plan of circularlity and sometimes in combination of other forms, leading to a cosmogram.

One has to remember that "culture is what makes humans human" (Rapoport 1993:12). The sensory modalities promote behavioural, psychic setting in the spatial and temporal organization of cultural landscape as exemplified by the existing traditions of pilgrimage circuits in Varanasi. The comparative study of the cosmogram and pilgrimage system reflects that the organization and symbolism evolved in the past are still preserved and practised by the devout and pilgrims. If traditions are lost, our identity will be in danger!

From Macrocosmos to Mesocosmos

In most of the old cultures, religion was an essential part of the symbolic nature of city planning and of the individual structures within cities, in which the analogy of human body has been accepted as a representation of the universe. The manifestation of a transcendental element (called *hierophany* by Eliade) may be translated into a parallelism between the *macrocosmos* (cosmos/heaven) and the *microcosmos* (temple/human body). In between these two polarities one can also perceive mediating spatial sacred space of the large scale natural world and the built-up environment, called the *mesocosmos* (the earth). The archetypal frame of Varanasi may be considered as a *mesocosmos* mediating between

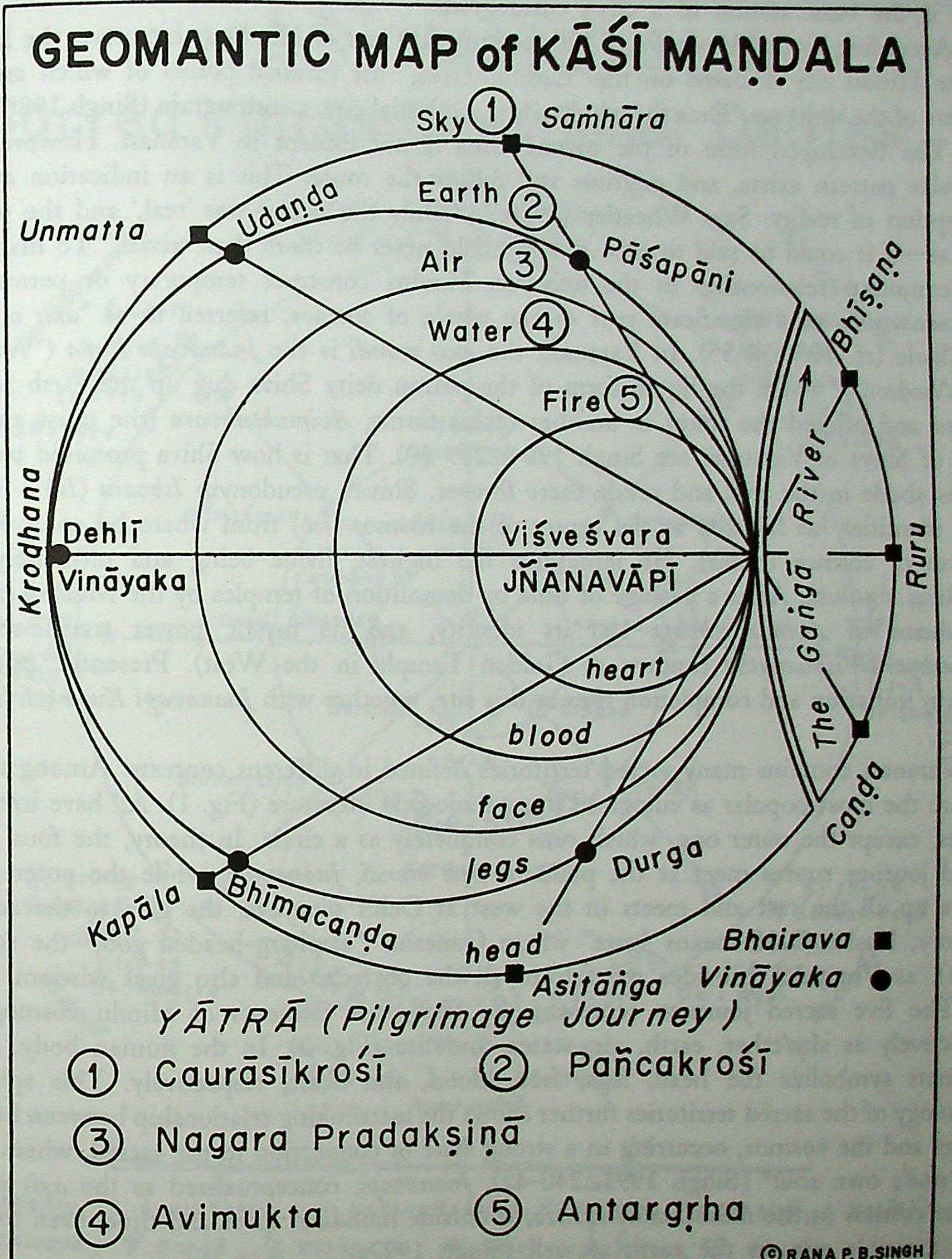

GEOMANTIC MAP of KĀŚĪ MAṆḌALA
Sky ①
Saṁhāra
Earth ②
Udaṇḍa
Unmatta
Air ③
Pāśapāṇi
Water ④
Bhīṣaṇa
Fire ⑤
Krodhana
Dehlī
Vināyaka
Viśveśvara
JÑĀNAVĀPĪ
The Gaṅgā River
Ruru
heart
blood
face
Caṇḍa
legs
Durga
Kapāla
Bhīmacaṇḍa
head
Asitāṅga
Bhairava ■
Vināyaka ●
YĀTRĀ (Pilgrimage Journey)
① Caurāsīkrośī
② Pañcakrośī
③ Nagara Pradakṣiṇā
④ Avimukta
⑤ Antargṛha
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Fig. 2 Geomantic map of Kasi Mandala

the *macrocosmos* of the universe and the *microcosmos* of the individual unit (Singh 1993a:240). This is the basic notion of a city's cosmogram.

According to the *Manasara*, a 10th century AD text of Hindu architecture, the layout of the Hindu city is based on the "Cosmic cross," the cardinal points of which are the corners of the universe. Thus the whole city is a celestial city, a cosmogram (Singh 1988:444-45). The developed form of the cosmic cross is not evident in Varanasi. However, its irregular pattern exists, and pilgrims still follow the route. This is an indication of the perception of reality. Says Wheatley (1969:9), "Only the sacred was 'real,' and the purely secular—if it could be said to exist at all—could never be more than trivial." To maintain a harmonious relationship in the universe, Hindus construct temporary or permanent representations of a significant part or the whole of cosmos, referred to as "*axis mundi*" by Eliade (cf. 1959:36-55). In Varanasi, the *axis mundi* is the *Jnanavapi Kupa* ("Well of the Wisdom"), where the liquid form of the patron deity Shiva dug up the earth by his trident and offered the water to another of his forms, *Avimukteshvara* (the most ancient form of Shiva in Varanasi; see Singh 1994b:219-20). That is how Shiva promised to take up his abode in the well and reside there forever. Shiva's pseudonym *Ishvara* (*Ish* + *chara*) itself identifies his identity at the centre of the cosmos (*ish*) from where he controls the rhythm of cosmos (*chara*). He represents the highest divine being and ultimately the worldless absolute. After a passage of time by demolition of temples by the Muslim rulers, the shrine of *Avimukteshvara* lost its identity, and its mystic power transferred to *Vishveshvara/Vishvanatha* (known as Golden Temple in the West). Presently, pilgrims perform initiation and completion rites at this site, together with *Jnanavapi Kupa* (cf. Singh 1994c).

Varanasi contains many sacred territories defined in different contexts. Among them, five are the most popular as eulogized in mythological literature (Fig. 1). All have irregular shapes, except the outer one, which runs completely as a circle. In theory, the four inner sacred journey routes meet at the point of *axis mundi*, *Jnanavapi*, while the outer circle covers up all the rest and meets in the west at Dehli *vinayaka*, the gate to the cosmic territory, Kashi. *Dehli* means "gate" where Ganesha ("elephant-headed god," the son of Shiva), as Vinayaka, provides relief from all the obstacles and also gives wisdom.

The five sacred journeys represent the five gross elements of Hindu cosmogony, respectively as sky/ether, earth, air, water, and fire (Fig. 2). In the human body, these elements symbolize the head, legs, face, blood, and heart, respectively. This spiritual homology of the sacred territories further shows the interlinking relationship between human beings and the cosmos, occurring in a strong state of connection to the sacred, where "one sees one's own soul" (Singh 1993a:240-42). *Jnanavapi*, conceptualized as the *axis mundi* of the cosmos in the mesocosmic sphere, is outside mundane space and time, even though it is a visible site on the earth as well (Singh 1997a).

The outermost sacred circuit (*Chaurashikroshi Yatra*), symbolizing the shadow of cosmic light, is defined with reference to the shrine of Madhyameshvara as the centre and Dehli Vinayaka as the radial point, at a distance of 5 *kroshas* (equal to 11 miles/17.6 km). Its

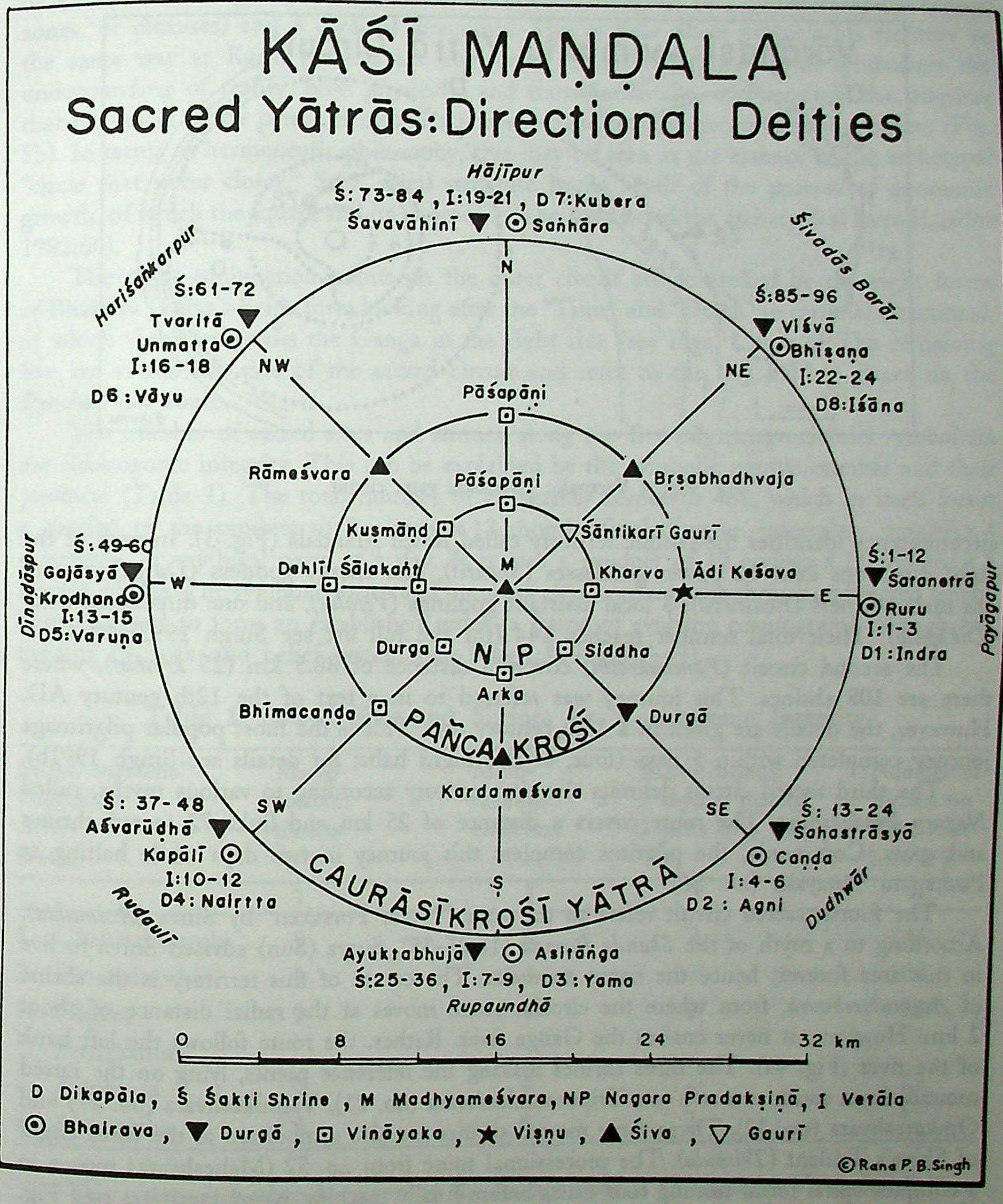
KĀŚĪ MAṆḌALA
Sacred Yātrās: Directional Deities
Hājīpur
Ś:73-84, I:19-21, D7:Kubera
Śavavāhinī
Saṅhāra
N
Hariśaṅkarpur
Ś:61-72
Tvaritā
Unmatta
I:16-18
D6:Vāyu
NW
Śivodās Barār
Ś:85-96
Viśvā
Bhīṣaṇa
I:22-24
D8:Īśāna
NE
Pāśapāṇi
Rāmeśvara
Bṛṣabhadhvaja
Pāśapāṇi
Kuṣmāṇḍ
Śāntikarī Gaurī
M
Dinadāspur
Ś:49-60
Gajāsyā
Krodhana
I:13-15
D5:Varuṇa
W
Dehlī
Śālakaṅt
Kharva
Ādi Keśava
E
Ś:1-12
Śatanetrā
Ruru
I:1-3
D1:Indra
Payāgapur
Durga
N P
Siddha
Arka
Bhīmacaṇḍa
PAÑCA KROŚĪ
Durgā
Kardameśvara
SW
SE
Ś: 37-48
Aśvarūḍhā
Kapālī
I:10-12
D4:Nairṛta
Ruḍaulī
Ś:13-24
Śahastrāsyā
Caṇḍa
I:4-6
D2:Agni
Dudhwār
S
CAURĀSĪKROŚĪ YĀTRĀ
Ayuktabhujā
Asitāṅga
Ś:25-36, I:7-9, D3:Yama
Rupaundhā
0
8
16
24
32 km
D Dikapāla, Ś Śakti Shrine, M Madhyameśvara, NP Nagara Pradakṣiṇā, I Vetāla
Bhairava, Durgā, Vināyaka, Viṣṇu, Śiva, Gaurī
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Fig. 3 Kasi Mandala — Sacred Yatras : Directional Deities·

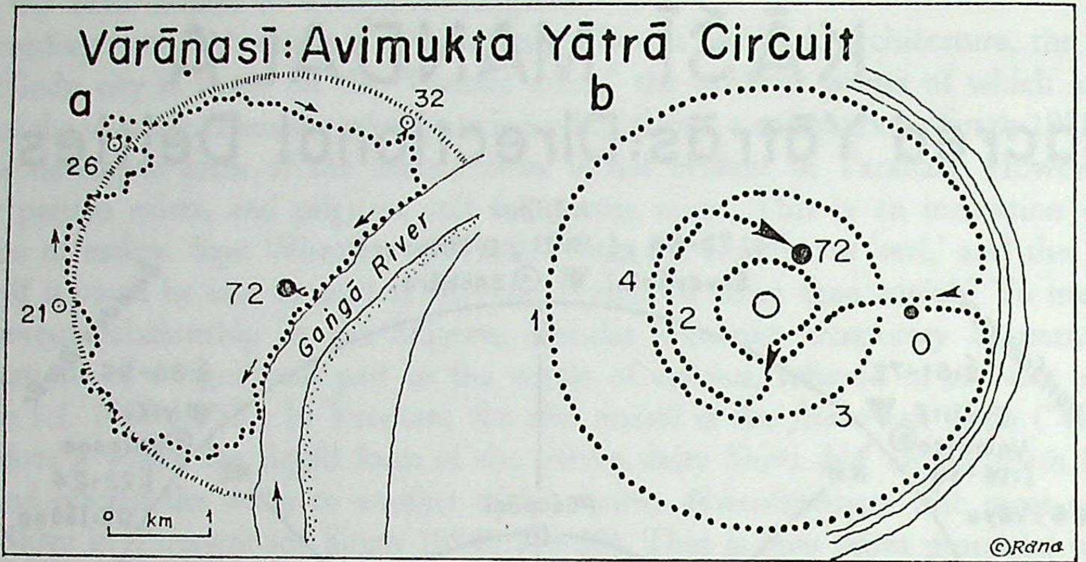


Fig. 4 Varanasi : Avimukta yatra circuit

circumference identifies the cosmic territory called Kashi Mandala (Fig. 3). In each of the eight directions exist 12 power-goddesses (*Shaktis*), one energy-goddess (*Durga*), one of her male partners (*Bhairava*), 3 local assistant godlings (*Vetalas*), and one directional deity (*Dikapala*). Their total number reaches 144 (for the full list see Singh 1993b:40-41).

The second circuit (*Panchakroshi*) covers a distance of 88.5 km (25 *kroshas*), where there are 108 shrines. This journey was referred to in a text of the 12th century AD. However, the details are given in a 16th century text. This is the most popular pilgrimage journey completed within 5 days (four, or five night halts; for details see Singh 1991b).

The third sacred circuit delimits the city territory according to various myths, called *Nagara Pradakshina*. The route covers a distance of 25 km and links 72 sacred shrines and spots. Commonly, the pilgrims complete this journey in two days while halting at Pashapani Vinayaka (no. 36).

The fourth sacred circuit refers to the zone "Never Forsaken" by Shiva (*Avimukta*). According to a myth of the *Skanda Purana* (16.25-35), Surya (Sun) advised Shiva to live in this area forever, hence the name *avimukta*. The centre of this territory is the shrine of *Avimukteshvara*, from where the circular route moves at the radial distance of about 2 km. However, it never crosses the Ganga river. Rather, the route follows the left bank of the river (Fig. 4a). The three shrines making the reference points, lying on the raised mound, from south to north are: Tripurantakeshvara (no. 21), Valmikeshvara (no. 27) and Omkareshvara (no. 32). These three mound shrines are also symbolized as the three edges of Shiva's Trident (*Trishula*). The processional route from no. 52 (Maheshvara) moves in a complex spiral form, turning four times before finally reaching Avimukteshvara (see Fig. 4b).

The fifth circuit, the inner *sanctum* (*Antargriha*), moves seven times around the temple of Vishveshvara (Fig. 5a). It symbolizes the cosmic integrity, i.e., 7 *chakras* (spinal energy zones, or plexuses) and 8 cardinal directions. This is how Shiva protects his territory in the same way as Kashi protects his own body. The seven-round spiral symbolizes the understanding of reality, both physically and transcendentally, and reminds the pilgrims that the resort of the patron deity Shiva is everywhere but the circumference nowhere (Fig. 5b). In terms of hermeneutic philosophy, this may be seen as the essence of the archetypal "circle that never closes." Such spiral structure is the result of the process of gnomonic growth, of which the square and its gnomon can be considered the archetypical form (Lawlor 1982:66).

The eight conjunction points on the outer circuit are controlled by the eight forms of Bhairava (Shiva's fierce form looking after the "Time" and "Death" in cardinal directions), of which three are across the Ganga in the right side (see Figs. 1 and 2). The remaining five are at the left side of the sacred circuit and refer to the five halting places on the *Panchakroshi* route.

The number of sacred sites and shrines along the five pilgrimage circuits symbolizes the cosmogonic integrity. This can be explained by the symbolic cosmic number and their products (Table 1). The total number of all shrines comes to 468, which in itself forms a parallel to the product of 9 planets x 13 months (including an intercalary month) x 4 directions, or mythical parts of a day. It is also a product of 12 zodiacs x 13 months x 3 mythic realms. The symbolic forms and numbers characterizing the shrines and sacred circuit have emerged to form an established order (a frame of evolving cosmogram) through the binding of faith and belief system (see Singh 1993a:247-49).

Table 1. Sacred Sites and Shrines Vs. Cosmogonic Integrity

Sacred segment/ Pilgrimage circuit (*Yatra*)	Macro-cosmos: planets		Meso-cosmos: Direction		Micro-cosmos: 3 mythic realms/ 2 parts of a day	Number of shrines on the circuit: 1 x 2 x 3
	1	x	2	x	3	4
1. Chaurashikroshi	9		8		2	144
2. Panchakroshi	9		4		3	108
3. Nagara Pradakshina	9		4		2	72
4. Avimukta	9		4		2	72
5. Antargriha	9		4		2	72

This system is further developed in the arrangement of 56 Ganesha/Vinayaka shrines. Vinayaka protects the dwellers or visitors to this city from obstacles at eight cardinal

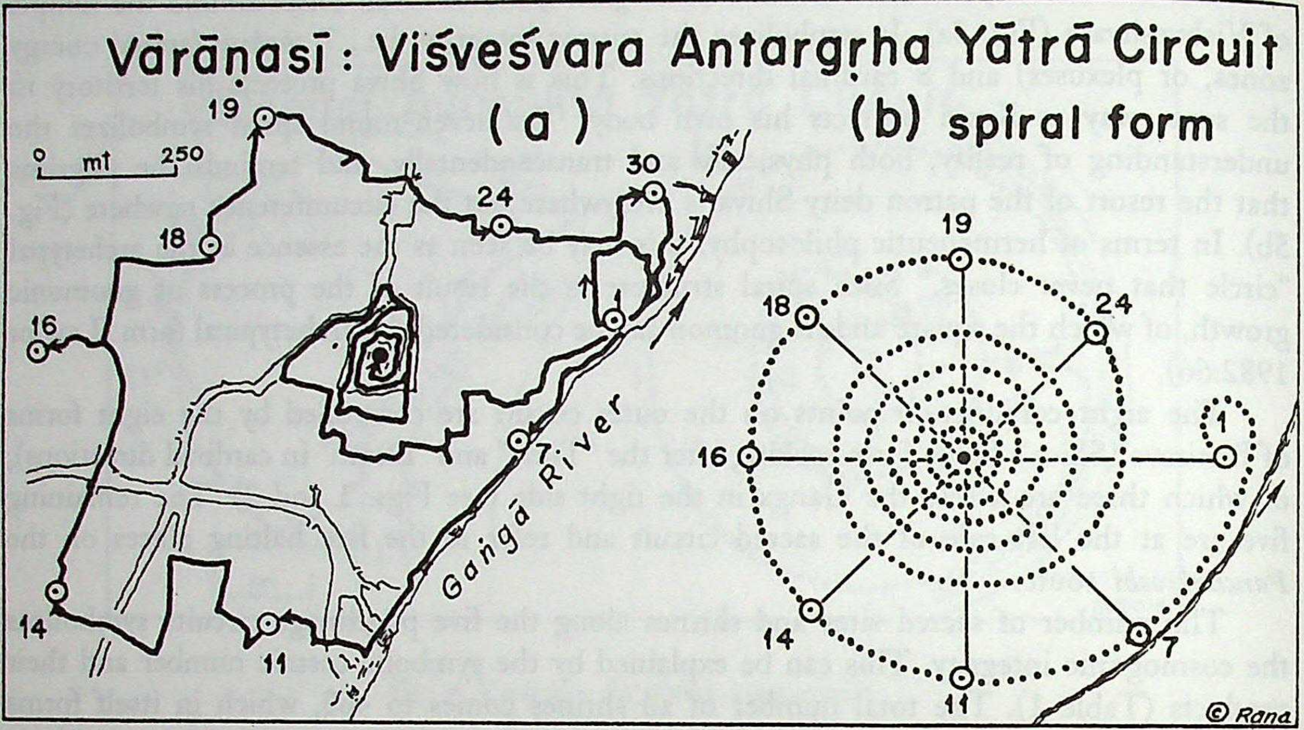


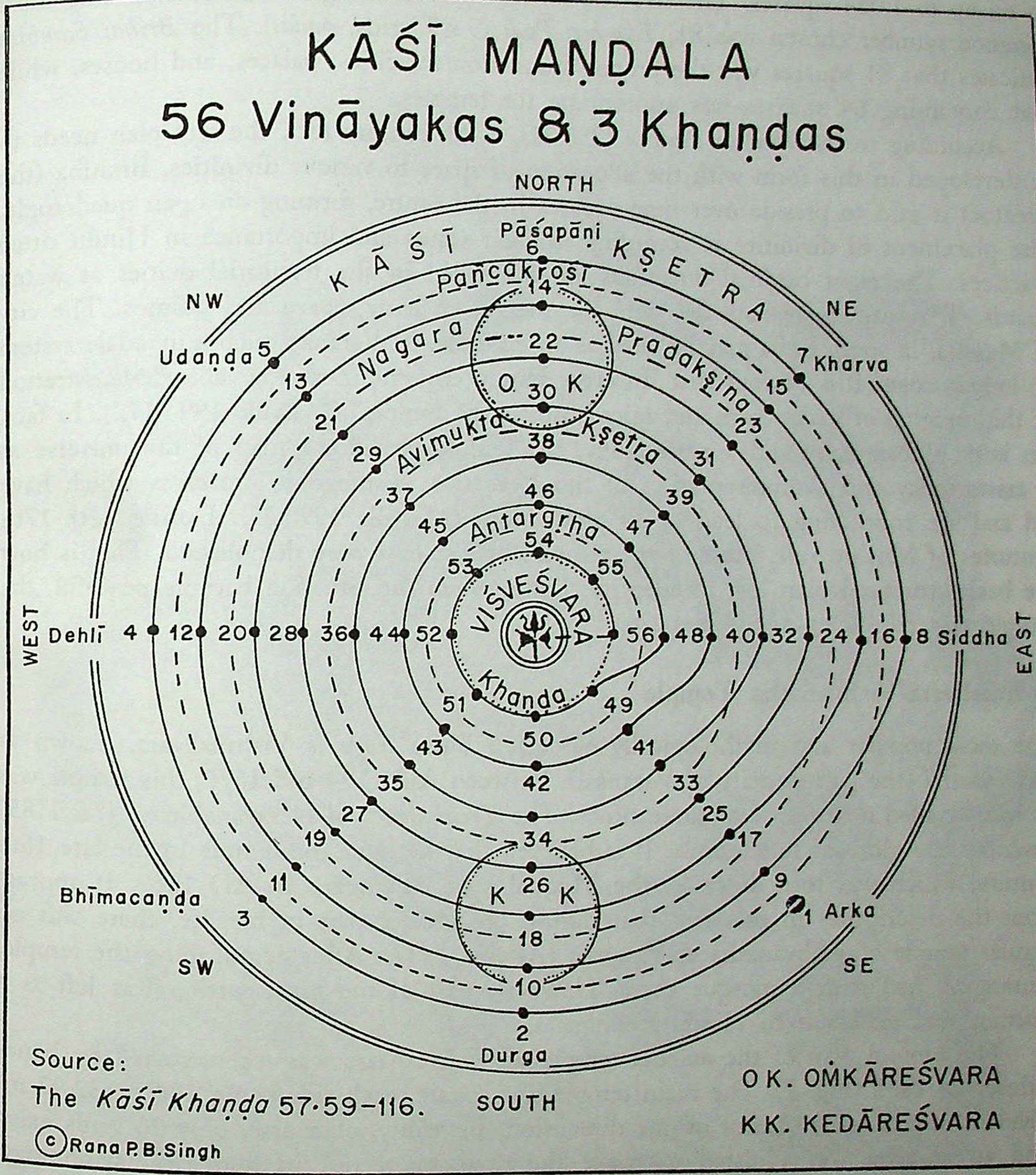
Fig. 5 Varanasi : Visvesvara Antargrha yatra circuit

directions in all the seven layers of the realm between earth and heaven (symbolically representing seven layers of the atmosphere). They serve as *lokapala*, the directional guardians of the universe and residents at all the cardinal junctions. The number and location of 56 Vinayakas can be represented in a spatio-cosmological model showing the eight directions, seven layers, three sacred segments of Varanasi and the interlinking routes of pilgrimage journeys in spiral form (Fig. 6). The sequential arrangement of 56 Vinayakas is arranged in a model as described in the mythologies and followed by the pilgrims performing the sacred journey. The arrangement symbolizes the concept of universe within universe, i.e., interconnecting macrocosmos, mesocosmos, and microcosmos (see Singh 1995a, 1995b).

From Macrocosmos to Microcosmos

The use of the symbolism of the human body reveals another level of meaning of the microcosm. This was vividly described in the *Vastu-Vidya*, the science of architecture. Though it was already an accepted branch of knowledge in Vedic times, this structure was interpreted in a religious context and its phenomenal structural plan, which can be explained by the Vedic sacrificial rite. The spiral form symbolizes movement, the cyclic movement of time. This is how the circumambulation is performed. A round altar symbolizes the terrestrial world, and a square in it, the celestial (cf. Volwahsen 1969:44).

The ground plan of the temple itself is a mandala, representing an "image of the laws governing the cosmos, to which men are just as subject as is the earth on which


KĀŚĪ MANḌALA
56 Vināyakas & 3 Khaṇḍas
NORTH
SOUTH
EAST
WEST
NW
NE
SW
SE
Kāśī Kṣetra
Pañcakrośī
Nagara Pradakṣiṇa
Avimukta Kṣetra
Antargṛha
Viśveśvara Khaṇḍa
Pāśapāṇi 6
Udaṇḍa 5
7 Kharva
Dehlī 4
8 Siddha
Bhīmacaṇḍa 3
1 Arka
2 Durga
14
22
30
O K
38
46
54
13
15
21
23
29
31
37
39
45
47
53
55
12
20
28
36
44
52
56
48
40
32
24
16
51
49
50
43
41
42
35
33
27
25
34
19
17
26
K K
11
9
18
10

Source:
The *Kāśī Khaṇḍa* 57·59–116.

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OK. OṀKĀREŚVARA
KK. KEDĀREŚVARA

Fig. 6 Kasi Mandala — 56 Vinayakas and 3 Khandas

they build" (*ibid.*:44). The circumambulation symbolizes the cosmic journey and its cognition. According to the *Vastu shastras* (manuals on architecture), the basic cosmogram (*Vastu-Purusha Mandala*) for a surface plan can be drawn in 32 ways; the simplest one consists of a square, which may be divided into 4, 9, 16, 25, 36, 49, 64, 81, 100 and so on up to 1,024 squares. The size chosen for these drawings is immaterial. The most common number chosen was 81, *Ekashiti Padi* (9 x 9 grids, *padas*). The *Brihat Samhita* indicates that 81 squares was the proper foundation for cities, palaces, and houses, while that containing 64 squares was appropriate for temples.

According to the *Matsya Purana* (253.21), a 9th century text, the city plan needs to be developed in this form with the allocation of space to various divinities. Brahma (the Creator) is said to preside over nine squares in the centre, forming an open quadrangle. The placement of divinities is according to their status and importance in Hindu ritual practices. The eight cardinal directions are controlled by the territorial deities as watch guards. This plan represents the symbolic merger of body, space and cosmos. The city of Madurai in south India may be cited as an example. In Varanasi such a mandala system no longer exists. It is obvious that "In every Hindu city, the most accessible demonstration of the merging of macrocosm and microcosm is the temple" (Malville 1994:172). In fact, "In both a cosmology and a cosmogony, the temple provides a map of the universe as it exists today and a representation of those creative, cosmogonic processes which have led and are continuing to lead to its production" (Malville 1992:25). During 12th-17th centuries of Muslim rule, most of the temples of Varanasi were demolished. That is how the basic structural plan lost its identity. Later, when the situation became peaceful, the temple was rebuilt at a different site.

Vishveshvara/Vishvanatha Temple

The most popular and mythologically eulogized Shiva *linga* is Vishveshvara, known as Vishvanatha (the patron deity of Varanasi). Between AD 1194 and 1670, this temple was probably pulled down at least three times. The *Tristhalisetu* of Narayanabhatta (ca. 1585) describes the glory of this temple. It is believed that he built the temple in the late 16th century, which was torn down by the Mughal king Aurangzeb in AD 1669. It appears from the description in this text that during the greater part of his life, there was no regular temple of Vishvanatha at Varanasi (Altekar 1937). After demolishing the temple, Aurangzeb had built a mosque there. However, part of the back portion was left as a warning and an insult to Hindu feelings.

The ground plan of the ancient temple of Vishveshvara was reconstructed by James Prinsep in 1831 (Fig. 7). The main temple was square, each side being 108 ft (32.92 m) divided into 27 grids (*padas*) in one dimension. In reality, of course, only 26 grids exist, and an additive was adjusted to make the cosmogram real in numerical symbology. Regarding the square plan, Malville (1992:25) comments, "The square protects the interior and may also represent the ecliptic, the cyclic pathway taken by the sun as it measures out time." The main shrine lying in the centre was also in a square of 64 (8 x 8) grids, each grid was 16 ft^2 ($1.49m^2$). This is a form of *manduka* mandala, at the centre of which was the main *linga*, Shiva's symbol lying in an ornamental reservoir. "Its corners are at the same time the corners of the external outline of the cell" (Volwahsen 1969:52).

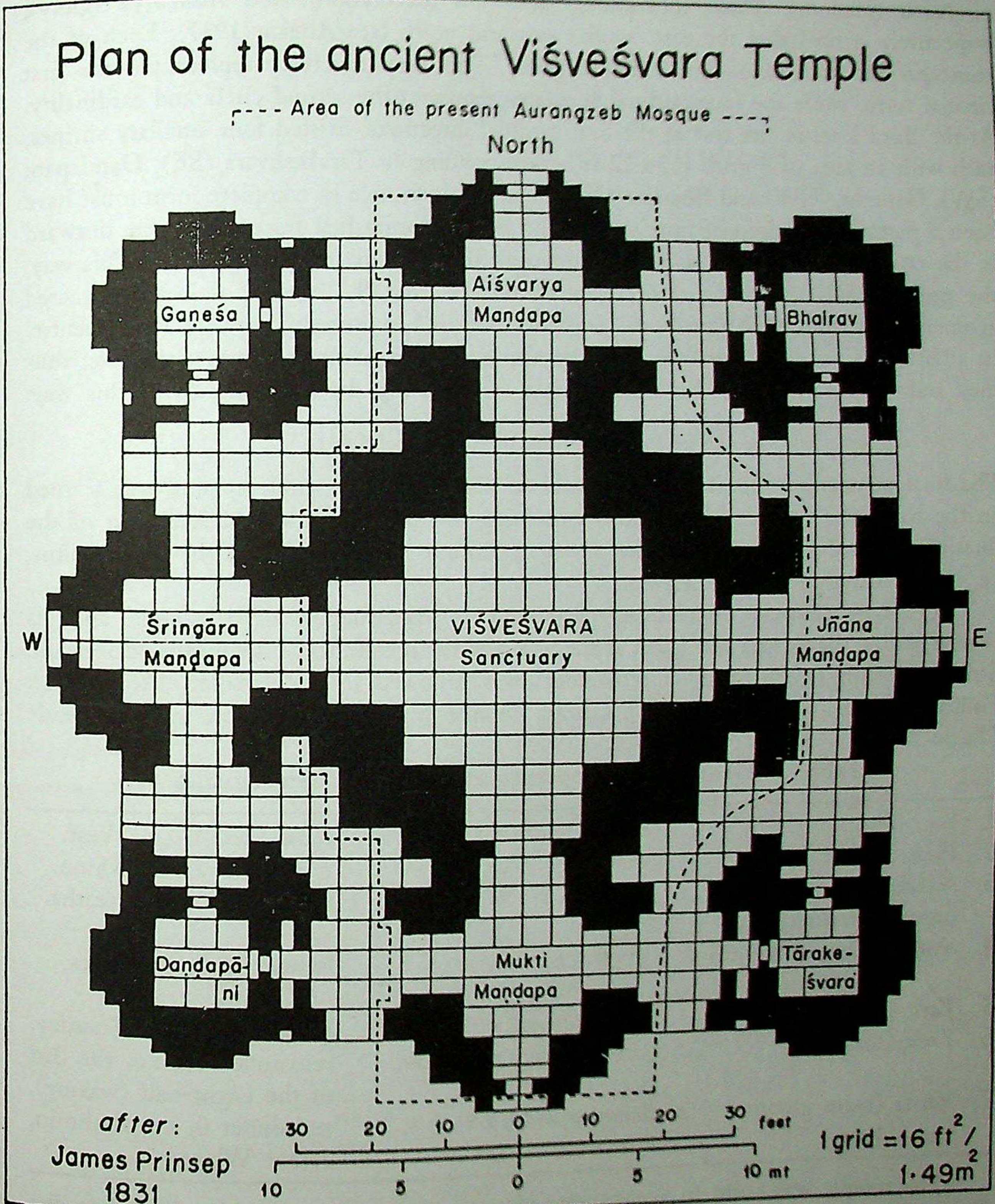

Plan of the ancient Viśveśvara Temple
Area of the present Aurangzeb Mosque
North
Aiśvarya Maṇḍapa
Gaṇeśa
Bhairav
W
Śringāra Maṇḍapa
VIŚVEŚVARA Sanctuary
Jñāna Maṇḍapa
E
Daṇḍapā-ṇi
Mukti Maṇḍapa
Tārake-śvara
after: James Prinsep 1831
30 20 10 0 10 20 30 feet
10 5 0 5 10 mt
1 grid = 16 ft²/ 1·49m²

Fig. 7 Plan of the ancient Visvesvara Temple

Adjoining the central sanctuary, there were four ante-chambers (*mandapas*) corresponding to *Jnana* (wisdom), *Mukti* (liberation), *Shringara* (decoration), and *Aishvarya* (glory), respectively symbolizing the east, south, west and north (see Altekar 1937). Each of the *mandapas* had an area of 16x16 ft^2 (16 grids). The inner sanctuary represented the first circular form, while the four cardinal *mandapas* represent the second circle and cardinality. At the third level in the rest of the four cardinal directions, existed four ancillary shrines, each with an area of 9 grids (12 x 12 ft^2) corresponding to Tarakeshvara (SE), Dandapani (SW), Ganesha (NW) and Bhairava (NE). The whole temple in complete form must have been a picturesque group of nine spires. The height diminished from the centre outward in the ratio of 16, 8, and 6, as may be inferred from the ground plan (Fig. 8). This way, the grid-mandala consisting respectively of 64, 16, and 9, together reflect the sacred geometry. The four main directional grids of 16 each had emerged into 64 at the centre. In addition to ancillary *mandapa*, close by also existed eight more 9-grid chambers; thus their number reached 12. This is comparale to 9x12=108. In total, calculated this way:

$$[(16 \times 4) + 64 + \{(9 \times 4) + (9 \times 8\}]$$

The final number of open-chambers comes to 236. The triple circle symbol was formed on the basis of a framework and grid consisting of essentially the representation of the three mythic realms, symbolizing the power of Shiva as the controller of the three realms, i.e., earth, atmosphere, and heaven.

In Indian classical calculations pertaining to construction of a temple and its characteristics, the integer was taken as the base and the remainder as the means of decision. Strictly speaking a "doctrine of remainder" was followed (see Volwahsen 1969:50-51). Following that principle, the Vishveshvara temple may also be placed on that scale (Table 2).

Table 2. Geometrical properties and related characteristics

1. *Yoni* (direction)	:	(temple width x 3) / 8;	remainder 4, i.e. West.
2. *Vyasa* (planet)	:	(width x 9) / 10;	remainder 2, i.e. Moon.
3. *Nakshatra* (lunar asterism)	:	(Length x 8) /27;	remainder 0, i.e. Jyestha.
4. *Aya* (zodiac, or month)	:	(length x 8) /12;	remainder 0, i.e. Aries, or Chaitra
5. *Vara* (the day)	:	(circumference x 9) / 7;	remainder 3, i.e. Tuesday.
6. *Tithi* (time)	:	(circumference x 9) / 30;	remainder 18, i.e. the 3rd of the Light-half (waxing).
7. *Varna* (caste group and colour)	:	(length x width x 9) / 4;	remainder 0, i.e. Brahmin, colour White.

The temple was built on a *navaratna* plan, i.e., nine spires altogether including the highest central one (128 ft/39m). The corner spires were about 48 ft/14.6 m high and those over the *mandapas* were 64 ft/19.5 m (Verma 1971-84:201). The main ground plan

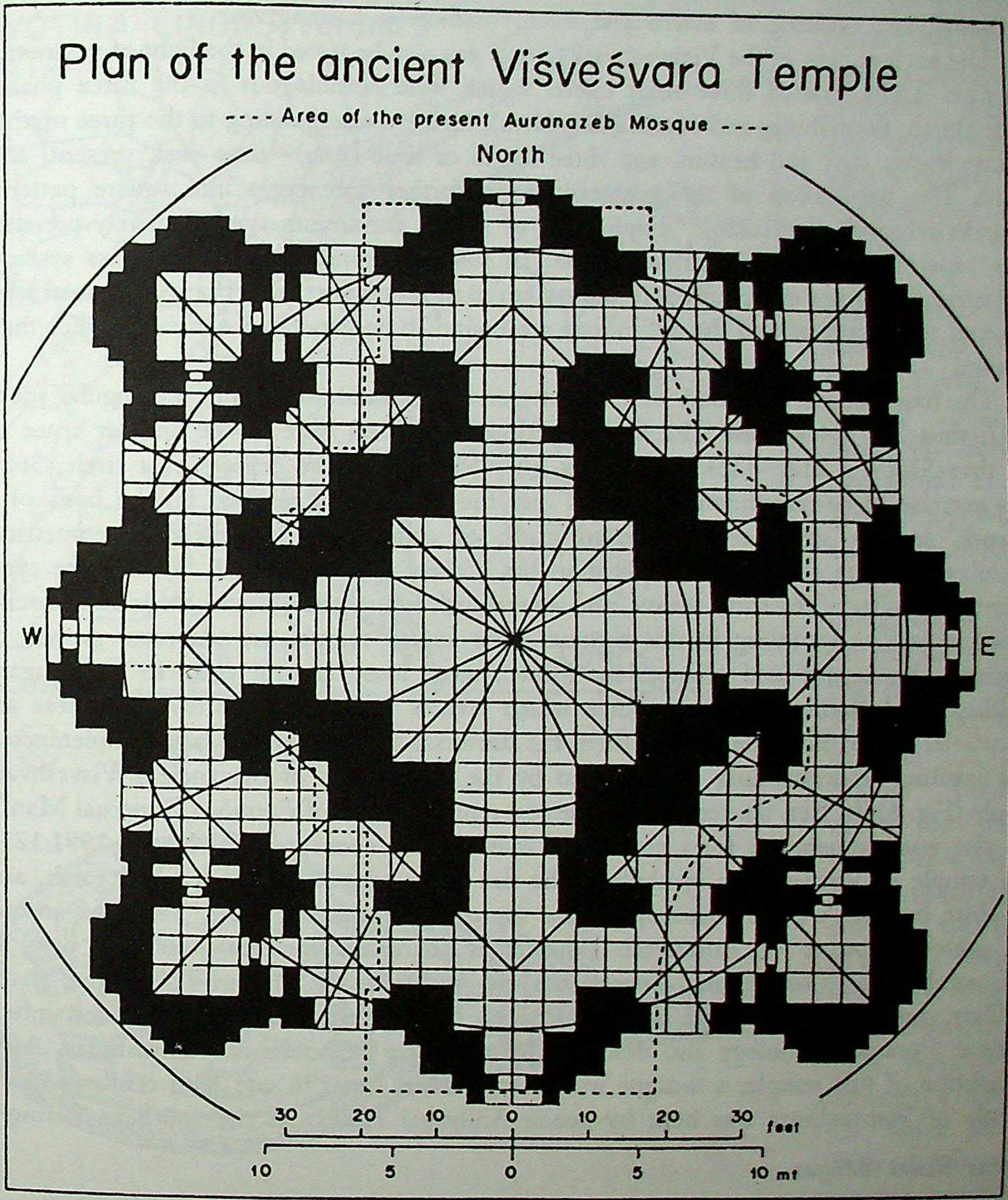

Plan of the ancient Viśveśvara Temple
---- Area of the present Auranazeb Mosque ----
North
W
E
30 20 10 0 10 20 30 feet
10 5 0 5 10 mt

Fig. 8 Plan of the ancient Visvesvara Temple

recorded a series of 676 grids, *padas* (26 x 26), of which each grid was 4 ft x 4 ft. In addition, at each of the four corner extensions, there were six such grids. Furthermore, seven grids were also at the four directional parts. Thus in total, the number reached 728. With a minor adjustment of 1, the number reached 729, symbolizing the product of 27 x 27 (lunar asterisms), i.e., meeting of macro and micro cosmos—a cosmogram.

The ancient plan of the Vishveshvara temple can also be tested in the light of geometric structure. There existed three basic circles which were homologous to the three phases of life (birth, flourishing, and death-and-rebirth), further corresponding to the three mythic realms—earth, sky, and heaven, and three stages of time (*kala*)—time past, present, and future. The triplication of the geometric form further submerges into square pattern. Remarks Maxwell (1991:286): "Triplication of such a continuum-symbol merely presents three aspects of the same eternal process. In such a beginningless and endless system, geometrically defined space proper to the system itself (as distinct from borrowed constructs) is bound to be cyclical and the definitions are bound to be generated naturally rather than imposed."

The four cardinal chambers were in between the two outer circles in the angular space of 37, thus 37° x 4 = 148°. The four directional chambers were in the angular space of 53°, thus 53 x 4 = 212°. This way, finally, they cover all of the degrees of a circle, 360°. This exercise of correspondence suggests that the temple was planned on the basis of a network, angular space and associated grids; of course this is merely a geometrical formalization. The structure of triplication has a close association with Shiva: three eyes, trident, controller of the three realms, and several such symmetrical triads. Stella Kramrisch's (1980) remark is appealing in this context: "The Indian temple, an exuberant growth of seemingly haphazard and numberless forms...never loses control over its extravagant wealth.... It visualizes the cosmic force which creates innumerable forms, and these are one whole, and without the least of them the universal harmony would lack completeness." This intuitive understanding is confirmed by the sacred plan of the ancient Visveshvara temple (Fig. 8). In fact, the temple was the real representation of *Purusha* ("Supernal Man"), and also was a mnemonic for a number of cosmological concepts (cf. Malville 1991:123). The temple of Vishveshvara symbolizes the fire pillar connecting heaven and earth, and the close by holy well of Jnanavapi is the source of primordial water. The area around the present mosque of Aurangzeb (known as Jnanavapi mosque) was the path of circumambulation (*pradakshina*) around the old Vishveshvara temple. There were many ancillary shrines on the temple walls which lost their identity after its conversion into a mosque. Puranic mythology also describes Jnanavapi to the south of Vishveshvara. After demolition of this temple, a mosque was erected there. Later in late 18th century, a new temple of Vishveshvara was built by queen Ahilyabai Holkar in the southern vicinity.

Other Shiva *Lingas*

In various temples of Varanasi one finds special forms of *lingas* associated with sacred geometry and cosmic connotation. A few examples may be cited. The Bayalisha-Lingi *Linga* at Kapiladhara on the Panchakroshi route represents the total form of Shri Yantra's triangles. Shri Yantra is drawn from nine triangles, four pointed downward and five upward, thus forming 42 (6 x 7) triangular fragments around a central triangle (see Singh 1991:122-23).

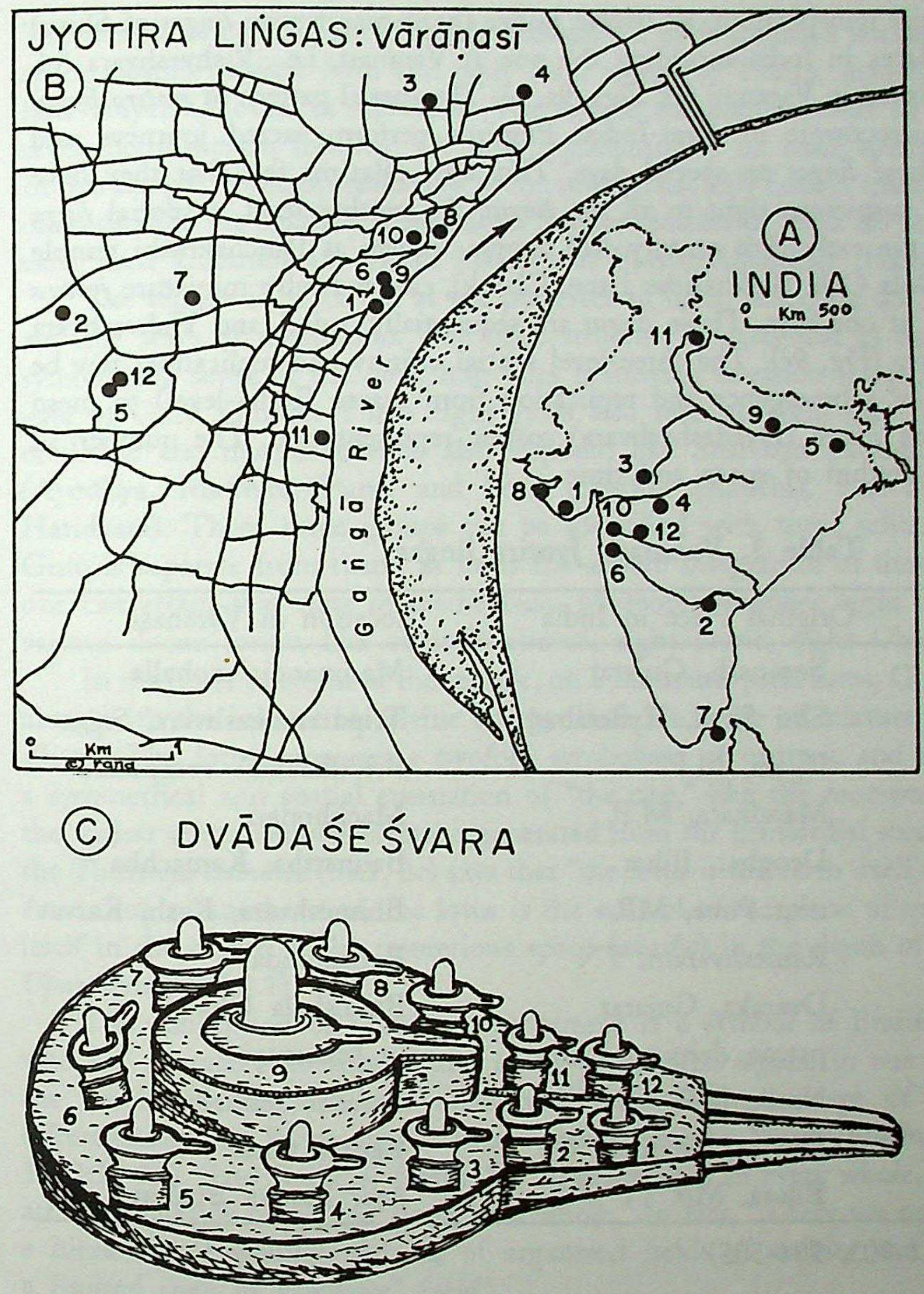


Fig. 9 *Jyotira Lingas*: Varanasi

There is probably no other set of triangles which interlock with such integrational perfection. This is also represented as a symbol of life, both universal and individual. In other ways, the seven sheaths (*chakras*) and six directions (including above and below) together make 42. Shiva is described as the greatest *yogi* who in all the junction of space, time and energy cycles reveals the cosmos. According to the *Kashi Khanda* (73), Shiva controls the three realms (heaven, earth, the netherworld) as a *Yogi* by His manifestive power of two layers of sheaths (seven up from navel base, and seven down), i.e., 14. This way, 3 x 14 becomes a total of 42. There are 42 different *lingas* at various places in Varanasi. However, all of them are represented in one structure at Kapiladhara (for list, see Singh 1987b:506). In this way, 42 represents the super-state of consciousness where macro and micro cosmos meet.

Dvadasheshvara *Linga*

By the process of spatial transposition, all twelve *jyotira* (light-manifestive *lingas* of Shiva) located in different places in India including the one at Varanasi, i.e., Vishveshvara (cf. Table 3), are re-established in Varanasi (cf. Figs. 9a, b). The spatial pattern of *jyotira lingas* makes Varanasi a microcosmic or mini-India. Pilgrims perform sacred journeys and auspicious sights to these *lingas* on special days. This way, pilgrims feel that they have acquired the merit of auspicious sight to all the *lingas*. At another level, a special *linga* of Dvadasheshvara in the early 19th century AD temple, known as Panchakroshi temple (house no. CK 5/33 Gola Gali, Bhikharidas Lane, Chauk), carries twelve miniature *jyotira lingas* made of crystal, at one base. These *lingas* are sequentially coded, and Vishveshvara (no. 9) lies at the centre (Fig. 9c). The three-level spatial affinity and replication may be compared to the idea of submergence and replication from macro (India-level) to meso (Varanasi city-level) and micro (Dvadasheshvara) cosmic representation. The number 12 represents the annual rhythm of space and time.

Table 3. Varanasi: Jyotira lingas

	The Linga	Original Place in India	Location in Varanasi
1.	Someshvara	Somnath, Gujarat	Manmandir mohalla
2.	Mallikarjuna	Shri Shail, Hyderabad	Tripurantakeshvara, Sigra
3.	Mahakaleshvara	Ujjain, M.P.	Briddhakala's compound
4.	Omkareshvara	Mandhata, M.P.	Machhodari
5.	Vaidyanatha	Deoghar, Bihar	Baijnattha, Kamachha
6.	Bhimashankara	near Pune, MR	Bhimeshvara, Kashi Karvat
7.	Rameshvara	Rameshvaram, TN	Ramakunda
8.	Nageshvara	Dvaraka, Gujarat	Bhonshala Ghat
9.	Vishveshvara	patron deity of Kashi	in Jnanavapi
10.	Traymbakeshvara	Nasik, MR	Baradeo mohalla
11.	Kedareshvara	Kedara, Chamoli, UP	Kedara Ghat
12.	Ghushmeshvara	Ellora, MR	near Batuka Bhairava

(*Source*: Singh 1987b : 503, 504-505)

Shiva *linga* is also represented with the human face (*mukha*), numbering from one to five, and symbolizing various states and roles of Shiva from *Ishvara* (the Supreme Lord) to *Panchamukhi* the controller of the five basic organic matters. Several other interpretations of cosmicized numbers related to different forms of divinities like Durgas (9), Chandis (9), Matrikas (9), Gauris (9), Bhairavas (16), Rishi-*lingas* (7), Vishnu (8), Suryas (12), etc., may also be explained in this context (cf. Singh 1987b; Singh and Malville 1995).

The Gurudham Temple

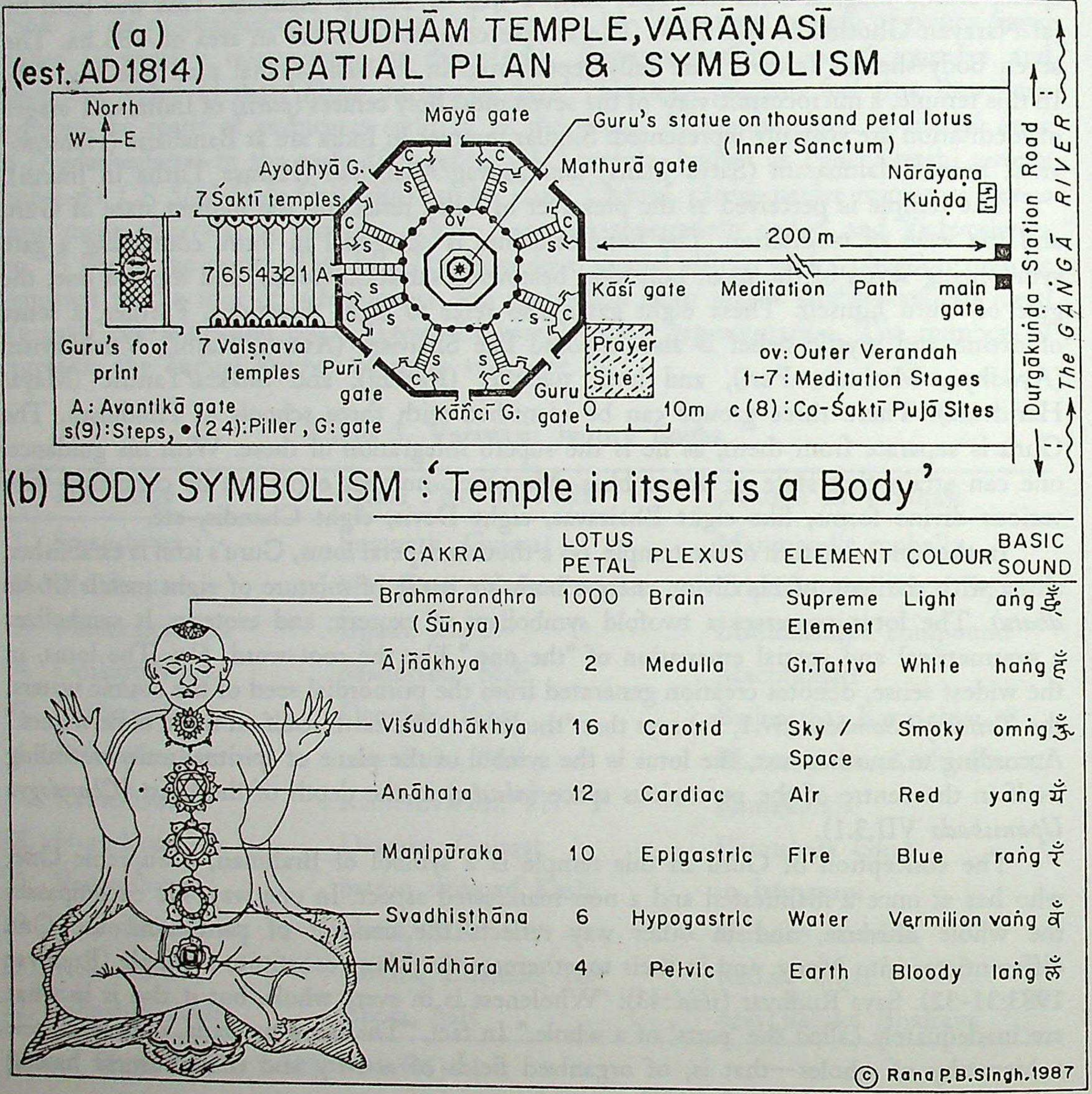
The temple as cosmogram is clearly exemplified by Gurudham temple where symbolism of space, cosmo-magical form and body form a web of Tantric mandala. This was built by Jai Narayan Ghoshal in AD 1814. The temple compound covers an area of 4.86 ha. The seven body-sheaths (*chakras*) are fully represented in its basic spatial plan (see Fig. 10). In this temple, a microcosmic view of the seven most holy centres (*puris*) of India, and stages of meditation are spatially represented. Similar temples in India are at Banabaria (Hanseshvari), near Cidambaram (Satya Jnana) and Prayag/Allahabad (Hamsa Tirtha in Jhunsi).

The temple is perceived as the preserver of light, reflecting the highest state of Guru and the ways of meditation. The basic structure is octagonal in form, containing a gate symbolizing seven of the most holy sites bestowing salvation (*puris*), and the last one, the gate of Guru himself. These eight gates also refer to eight directions. Further, a sense of divine and mystic belief is also imposed like Shaivism (Avanti, Kashi), Vaishnavism (Ayodhya, Mathura, Puri), and both together (Kanchi), and Shakta/Tantric (Maya/Haridvara). These three groups can be identified with three schools of Hinduism. The Guru is separate from them, as he is the superb integration of these. With his guidance, one can attain that state of divine bliss. Moreover, number eight can be compared with various divine forms, like eight Bhairavas, eight Devis, eight Chandis, etc.

In the inner sanctum of the temple, on a thousand-petal lotus, Guru's icon is established along with the icon of his divine energy: both are made of mixture of eight metals (*Ashta dhatu*). The lotus expresses a twofold symbolism of exoteric and esoteric. It symbolizes a symmetrical and spatial emanation of "the one," like the root-word, *Om*. The lotus, in the widest sense, denotes creation generated from the primordial seed of the cosmic waters; the *Taittiriya Samhita* (Sv.1, 3c) says that "the lotus is the earth itself on those same waters." According to another text, the lotus is the symbol of the plane of spiritual unity, revealing itself in the centre of the mysterious space (*akasha*) in the depth of the heart (*Chandogya Upanishada* VII.3.1).

The conception of Guru in this temple is a symbol of Brahman, a Supreme One, who has at once a manifested and a non-manifested aspect. In one way, He encompasses the whole universe, and in other way reflects the concept of pantheism: the One differentiates into Many, and in their togetherness the Many constitute a Whole (Rudhyar 1983:31-32). Says Rudhyar (*ibid.*:43): "Wholeness is in every whole, but it also is in what are inadequately called the 'parts' of a whole." In fact, "There are no parts, only wholes—a hierarchy of wholes—that is, of organized fields of activity and consciousness having a limited span of existence" (*ibid.*).

Following the analogy that "temple in itself is a body," the plexus system of *kundalini*, as described in the *Yoga* system, can be compared to the Gurudham temple. Each spot from lower to higher (seven layers) is symbolized by lotus petals, i.e., 4, 6, 10, 12, 16, 2 and 1000. A meditator has to follow the system in this sequence with the aim of reaching the highest state. Only then can he receive blessing from the Guru through touching his feet, as shown in the spatial plan of the temple (Fig. 10).


(a)
GURUDHĀM TEMPLE, VĀRĀṆASĪ
(est. AD 1814)
SPATIAL PLAN & SYMBOLISM
North
W
E
Māyā gate
Guru's statue on thousand petal lotus (Inner Sanctum)
Ayodhyā G.
Mathurā gate
7 Śaktī temples
Nārāyaṇa Kuṇḍa
200 m
7 6 5 4 3 2 1 A
ov
c
s
Kāśī gate
Meditation Path
main gate
Guru's foot print
7 Vaiṣṇava temples
Purī gate
Prayer Site
Guru gate
Kāñcī G.
0
10m
ov: Outer Verandah
1-7: Meditation Stages
c (8): Co-Śaktī Pujā Sites
A: Avantikā gate
s(9): Steps, ●(24): Piller, G: gate
Durgākuṇḍa–Station Road
The GAṄGĀ RIVER
(b) BODY SYMBOLISM: 'Temple in itself is a Body'

CAKRA	LOTUS PETAL	PLEXUS	ELEMENT	COLOUR	BASIC SOUND
Brahmarandhra (Śūnya)	1000	Brain	Supreme Element	Light	aṅg अँ
Ājñākhya	2	Medulla	Gt.Tattva	White	haṅg हँ
Viśuddhākhya	16	Carotid	Sky / Space	Smoky	omṅg ॐ
Anāhata	12	Cardiac	Air	Red	yaṅg यँ
Maṇipūraka	10	Epigastric	Fire	Blue	raṅg रँ
Svadhiṣṭhāna	6	Hypogastric	Water	Vermilion	vaṅg वँ
Mūlādhāra	4	Pelvic	Earth	Bloody	laṅg लँ

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Fig. 10 Gurudham Temple, Varanasi — spatial plan & symbolism

Presently the condition of the temple is very bad, mostly due to negligence, illegal occupancy of open space, and encroachment by the nearby settlers and colonizers. This temple will soon be out of the scene from the cityscape, and only the memory and remnants of such a great heritage will remain in stories.

City as Cosmogram: Images of Kashi

We are surrounded not by sense objects but by images that are invisible to everybody else. The symbolic expression of place, the set of symbols that gives the people of a culture orientation in space and time, is pervasive in Hindu culture. We find in Hinduism that places like special sites or natural sceneries, rivers, mountains, grounds, sacred buildings and sacred cities replicate the form and process of the cosmos. In fact, a passion for placement is basic to Hindu thought. Sacred place as "storied place" is eulogized in Hindu mythology, or oral epics, with divine connotation—there intersects myth and *terra firma.*

In the Vedic literature, Varanasi has, of course, not received much attention. However, in the Puranic literature and treatises, its glory has been vividly stated. The concept of image is described with various names like Kashi (The "Luminous"), Avimukta (The "Never-Forsaken" by Lord Shiva), Anadavana (The "Forest of Bliss"), and Rudravasa (The Dwelling place of Shiva"). The *mahatmya* (glorification) literature describes its various forms, shapes, territories, and associated sacred numbers. Among such symbols, the description of varying symbolic forms of Kashi/Varanasi in mythical time is unique in spatial exposition (cf. Singh 1988b:3-5). The *Nagara Khanda* of the *Skanda Purana* (ref. the *Kashi Rahasya*, SB Tika, p.119) describes the territorial form of the sacred city as it was in the four mythic eras (*yugas* in Hindi cosmology). Accordingly, the shape of Kashi was like a Trident (*trishula*) in *Krita/Satya* (an era of 1,728,000 years), a Disc (*cakra*) in Treta (1,296,000 years), Chariot (*ratha*) in *Dvapara* (864,000 years), and a Conch-shell (*shankha*) in *Kali* (432,000 years). These four forms clearly indicate the peopling and territorial demarcation through the sites of various shrines (Fig. 11).

The three forks of trident are represented by the three basic segmentary Shiva *lingas,* i.e., Omkareshvara in the north, Vishveshvara in the centre, and Kedareshvara in the south. These three *lingas* refer to the areas around them that were settled in ancient times and also are the patron deities of their respective segments (*khandas*). Metaphorically, it is said that Kashi lies upon the trident of Shiva.

The disc-form was developed in *Treta* and corresponds to the *Chaurashikroshi Yatra* as a circle with Madhyameshvara at the centre and Dehli Vinayaka (i.e., gate to the cosmic circle, controlled by Ganesha as guardian) as the radial point. It covers a circumambulation of the cosmos. However, this journey is now rarely performed. At the four cardinal points, there exists four Bhairava shrines. Bhairava is perceived as the terrifying form of Shiva who controls *kala* (time and death). He is also known as *Kala* Bhairava.

The form of a chariot (in *Dvapara*) may be explained with the location of seven forms of Shiva *lingas* as referred to in the text: Gokarneshvara, Shulatankeshvara, Manikarnikeshvara and Bharabhuteshvara as the four wheels of the chariot on which Vishveshvara is sitting, and Madhyameshvara and Omkareshvara as the driving horses, with the Ganga river as the path. The direction of movement towards north metaphorically indicates the search for Shiva's abode in the north (i.e., Kailasha), and also the search for the radiant spot on the cosmic path.

The present form (in *Kali yuga*) is comparable to a conch-shell. Including the above

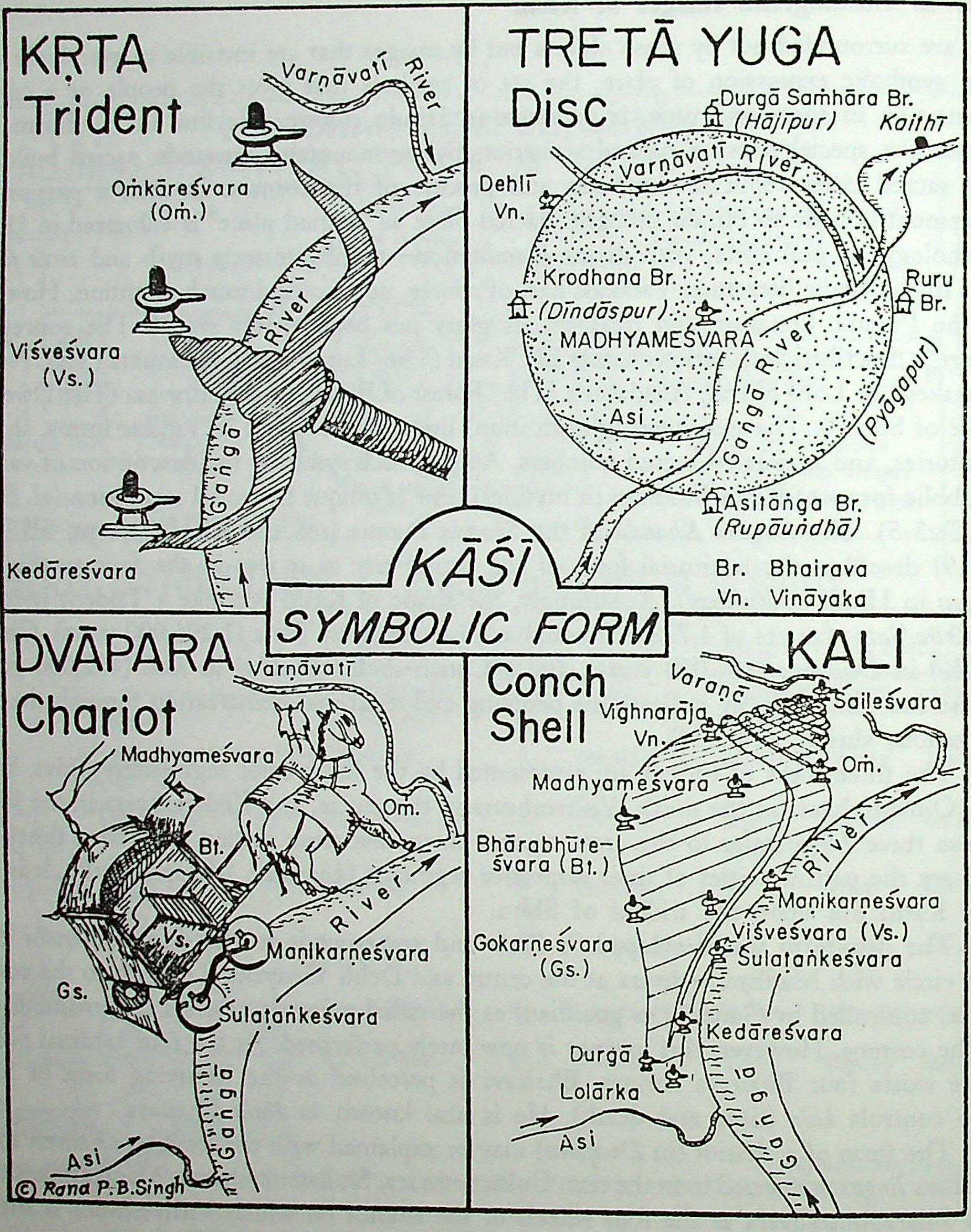
KṚTA
Trident
Varṇāvatī River
Oṁkāreśvara
(Oṁ.)
Viśveśvara
(Vs.)
Kedāreśvara
River
Gaṅgā
TRETĀ YUGA
Disc
Durgā Saṁhāra Br.
(Hājīpur)
Kaithī
Dehlī
Vn.
Varṇāvatī River
Krodhana Br.
(Dīndāspur)
MADHYAMEŚVARA
Ruru
Br.
(Pyāgapur)
Asi
Gaṅgā River
Asitāṅga Br.
(Rupāuṅdhā)
Br. Bhairava
Vn. Vināyaka
KĀŚĪ
SYMBOLIC FORM
DVĀPARA
Chariot
Varṇāvatī
Madhyameśvara
Om.
Bt.
Vs.
River
Maṇikarṇeśvara
Gs.
Śulaṭaṅkeśvara
Gaṅgā
Asi
© Rana P.B.Singh
KALI
Conch
Shell
Varaṇā
Śaileśvara
Vighnarāja
Vn.
Om.
Madhyameśvara
Bhārabhūte-
śvara (Bt.)
River
Maṇikarṇeśvara
Gokarṇeśvara
(Gs.)
Viśveśvara (Vs.)
Śulaṭaṅkeśvara
Kedāreśvara
Durgā
Lolārka
Asi
Gaṅgā

Fig. 11 Kasi : Symbolic form

six *lingas* (as in *Dvapara*), Vighnaraja Vinayaka in the north-west, Shaileshvara in the north along the Varana river, Kedareshvara in the south-east, and Lolarka in the south, it makes the shape of a conch-shell.

The description of the above four symbolic forms of Kashi is comparable to territorial strategy which establishes different degrees of access to people, things, and relationships to the scales of space, time, and faith. In all four forms, the Ganga river is the base. According to another description, the two water channels which delimit the territorial extent of the city in the north and south, can be compared to arteries of Shiva's mythical body. In the language of *yoga,* the rivers Asi and Varana, respectively, symbolize *ida* and *pingala*, and the third artery interlinking the Ganga to the Matsyodari, or the Brahmanala is referred to as *shushumna* (cf. *Kashi Khanda* 5.25-26; 33.167). The various holy sites are said to correspond to the parts of the body of Shiva, as he himself said, "Kashi is my body" (*ibid*.: 55.44).

According to another description in the *Kashi Khanda* (33.167-72), the city of Varanasi is Shiva's body, whose different parts are represented by the selective 18 *lingas.* Number 18 symbolizes the 18 branches of knowledge, including four Vedas, six parts of the Vedic divisions, and the rest of the branches. In this way, the city itself is the symbol of total knowledge. The visitation and performance of rituals at these sites provide the total knowledge. However, even by visiting a single *linga* of Puraneshvara, one can receive the similar merit (cf. *Kashi Khanda* 33.132), as this *linga* symbolizes all the 18 *lingas* at another level.

Following an oral tradition, the city also symbolizes Vishnu's body. The *Panchatirthis* (the five most sacred *ghats* among the total 84 along the Ganga) symbolizes the microcosmic body of Vishnu. Asi is the head, Dashashvamedha is the chest, Manikarnika is the navel, Panchaganga is the thighs, and Adi Keshava is the feet (Singh 1994b:217). This reminds us that Vishnu first placed his holy feet in Varanasi; that is why the area along the Ganga river is Vishnu's body (Singh 1996:95). The *Kashi Khanda* (84.114) says that "Having bathed in the five *tirthas*, a person never again receives a body of five-elements. Rather, he becomes the five-faced Shiva in Kashi." These myths refer to the close interdependency between Vaishnavite and Shaivite traditions; according to myth, Shiva and Vishnu are the one integral identity in Kashi (*ibid.:* 50.144).

Kashi is compared to a woman (*Kashi Khanda* 7.66) "whose two beautiful eyes are Lolarka (in the south) and Adi Keshava (in the north), whose two arms are the Varana (in the north) and the Asi river (in the south)." That is how the territory between the two rivers and two divine spots submerges into a divine energy represented in the form of a woman. At the next level, there are two shrines of the "City as Goddess." The small shrine of Kashi Devi at Lalita Ghat is eulogized as the giver of relief from all sins and the cycle of transmigration (cf. *Kashi Rahasya* 17.29). Similar description is also narrated for Varanasi Devi, whose shrine lies in the Trilochan temple (cf. *Kashi Khanda* 33.127). However, sometimes the city itself is referred to as the mother goddess (cf. *Kashi Khanda* 30.71).

The city is endowed with a special sense of immortality. The myth mentions that even during the cosmic dissolution, the city stands upon Shiva's trident like a lotus (*Kashi*

Khanda 44.29). The *Kashi Rahasya* (2.89) says:

What is that divine light
reflecting over water in arc,
Which even during cosmic flood
be seen as it was. (*Kashi*)

Moreover (*ibid.:* 2.95),

As an umbrella in the sky
there lies divine light,
Whose rays come on the earth
and make the Kashi bright.

Yupa

There still exists a sacrificial post known as *Yupa Sarovara* in the form of a stone pillar (*yupa,* or *skambha*), about 16 m in height and about 2 m in diametre, along the Panchakroshi route (near Sarang Talab). The *yupa* symbolizes the central post of the universe, the *axis mundi*. It also represents the full Man, divided into fourteen parts: seven parts above the navel, and the same number below. In this way, the pillar integrates the seven sheaths of Cosmic Man and the earthly man; it shows the mesocosm. According to folk legends, this is related to the mythic story of Karna, the son of the Sun-god, born from virgin mother of Pandavas, Kunti. This pillar represents archetypal separation of heaven and earth, and probably as the gnomon, it was erected and used to cast measured shadows. Now this site, like other sun-shrines and sacred spots, is in ruins; the stone there is quiet at the corner of a pond (see Malville 1985:220).

Concluding Remarks

Following the axiom that "reality is not external; reality exists in the human mind, and nowhere else," the sacred geometry of Varanasi can be understood as a result of the state of consciousness in which cosmic mystery may be perceived through the symbolic expression and experiences. Without the imperial system of growth, the city has evolved its own cosmogram. The complex structure of the city expresses how Puranic myths and the spatial dimension of sacrality can interact with each other and finally result in a synthesis of the holy and cosmic. Gutschow (1993:170) has rightly stated that, "The idea of a spatial mandala did not precede the town. On the contrary, the mandala mirrors an already existing world; it represents, somehow, the 'real' image of an otherwise confusing reality. It gives order to the unordered 'natural' topography of a spatial setting." In fact, the idea of the mandala conveys the Hindu notion of cosmic order (Gutschow 1993:172).

The spiritual sense of sacred geometry can furnish information, a background, but it cannot provide a compass. Myth supplies this compass and also helps to discover how to orient the spiritual map of the city. However, modern man has lost his sensual skill to orient the map in this direction. Nevertheless, the idea of an expanding universe can be clearly explained by these cosmo-magico models. From inside to the outer side, the universe territory expands. However, the intensity of its mystic power decreases. This inverse relationship demonstrates the idea of an expanding universe.

At present, with the impact of Westernization and materialism, modern man is trying to substitute the mythological and cosmological orientation of cities which was so important in the ancient past. New mythologies of technocracy exist in which distance of harmonic relationships between Man and Cosmos is increasing. Of course, the solution is not so easy! Nevertheless, the historical background of the cosmic layout of habitat would certainly provide some lessons in creating *balance* in the future (cf. Singh 1997b).

When and how the sacred geometry of cosmicized structure took shape without support of an imperial power is still an issue to be searched and re-searched. Parallel to James' view of the unconscious effect, the cosmicized frame became a part of Varanasi's personality—in all its mystic power and radiance (cf. James, cited by Mumford 1961:68).

VI

THE SUN AND ITS TEMPLES AT VARANASI: MEANING AND PATTERN IN THE THREE WORLDS OF KASHI

J.M. Malville and Rana P.B. Singh

Introduction

Every morning of the year, the power and significance of the sun are revealed on the banks of the Ganga at Varanasi. At its special time of day, the rising sun, accompanied by chanting of *mantras*, circling of oil lamps of *arati*, the ringing of bells, and ritual bathing, commands the attention of all on the *ghats* (Pls. 6.1 & 6.2).

The sun has many manifestations and many attributes, some of which are symbolized by the Adityas, children of Aditi and Prajapati (RV 1.89.16). During the early Vedic period, there were seven Adityas (RV 9.114.3) corresponding to the seven realms of the heavens established by the seven naked eye planets which circled the geocentric earth. By the time of the Brahmanas, the number rose to its canonical value of 12, which is associated with the twelve months of the solar year. The *Vishnu Purana* (I. 15) identifies them as Vishnu, Shakara, Aryaman, Dhuti, Tvastri, Pusan, Visasvat, Savitri, Mitra, Varuna, Amsha, and Bhaga. In Varanasi, the Adityas have been given names appropriate to the local setting. The *Kashi Khanda* (10.83; 46.45-46) initially gives a list of the 12 Adityas in Varanasi, but in later chapters (65 and 84), two more Adityas, Sumantvaditya and Karnaditya, are identified, establishing the total of fourteen Adityas of Varanasi (Singh 1987:511, 514).

The supremacy of sun worship at Varanasi, known as Kashi in religious perception, is indicated in the *Kashi Khanda* (43.10) by the fact that the Vedic king, Divodasa, removed all the divinities from Kashi except his family deity, Surya. The 9th century text, *Matsya Purana* (180.68), refers to Kashi as the abode of the sun, i.e. Alarkapuri, Alarka being one of the names of the sun god.

The Gahadavalas (Gaharwars) of Kanauj, who controlled the plain of the Ganga and lived in Varanasi until the fateful battle of Chandravanshis, were devotees of Surya and the Adityas. A Gahadavala inscription from AD 1163 refers to the building of a shrine of Gangaditya (Niyogi 1959: 255, App. B). An inscription of the last Gahadavala king, Jayachandra (Raja Jaichand), records a donation of a village in honour of the sun in AD 1173. Another of his inscriptions dated three years later refers to a bath that the king, took in the Ganga and the donation of a village in honour of Lolarka Kunda (Niyogi 1959: 255, App. B). An inscription from the late 12th century states that queen Goshala Devi took a bath in Lolarka Kunda and also donated a village (EI, Vol. 5: 116-18).

King Jayachandra was defeated in AD 1194 by the forces of Muhammad Ghori. In the great slaughter that ensued, the king was killed, Varanasi was sacked, and nearly 1,000 temples were destroyed. Fourteen hundred camels were required to carry away the loot (Smith 1909). All of the original structures associated with the Adityas were razed at that time or in the following decades. However, neither could the power of the sun nor the spirit of a devout people be vanquished, and the locations of the Adityas remained in the communal memory of the city, remembered by neighbours, pundits, and pilgrims, and it is believed that today's Aditya shrines reliably mark the locations of the original sun temples (Singh and Malville 1995).

Today the 14 Adityas of Varanasi are identified by a variety of small and unpretentious features: sun disks, lotus-form stones, or images of Surya alone or riding his chariot. These are set into walls or installed in small shrines or the precincts of temples. While the pilgrimage, *yatra*, to all 14 Adityas is described in texts such as Kedar Nath Vyasa (1987) and Kuber Nath Sukul (1977), the popularity of the *yatra* has waned, and today a number of the sites are difficult to locate without an experienced guide.

Hypothesis and Method

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Our initial hypothesis in this study was that the spatial pattern of the original sun temples and shrines could be revealed by a careful mapping of the Adityas as they presently exist. Because of the difficulty in establishing accurate bench-marks within this dense and complex city, we turned to the Global Positioning System of satellites (GPS) in order to obtain accurate coordinates of latitude and longitude of each Aditya. We consider the mapping of the sites of the original Aditya temples to be a form of "non-destructive archaeology" which can conceivably reveal early forms of urban planning in the city, as well as features of sun worship.

The cosmos of the Adityas in Kashi is highly textualized, primarily in the *Kashi Khanda*, one of seven sections (*khandas*) of the *Skanda Purana*. The *Kashi Khanda* contains descriptions of the city, its pilgrimage sites and locations, directions for ritual (*mahatmyas*), hymns of glorification and praise for the city and its deities. Each of the Adityas is described in the text, and the particular benefits of worshipping the sun at that site are detailed.

GPS Measurements: Mapping the Adityas

During February and March 1994, we obtained differential GPS measurements of the locations of the 14 Adityas. Two Garmin GPS-75 receivers were used for the purpose of minimizing the effects of Selective Availability, whereby the information received from the satellites is scrambled to prevent misuse of the technology. One receiver was fixed on the roof of the Hotel Ganges View of Asi Ghat, and the other was mobile. Measurements were based upon the WGS-84 (World Geodetic System 1984) datum. The base station was operated over a period of six weeks, generating more than 14,000 measurements of latitude and longitude. The average of these measurements resulted in a precision of approximately 0.01" (seconds of arc) in latitude which corresponds to 30 cm on the earth's surface. At each of the Adityas, latitude and longitude were measured every 10 seconds and integrated for at least 10 minutes. At those Adityas that lacked adequate horizons, we made our GPS measurements on the rooftops of nearby buildings.

Results

The locations of the Adityas and Madhyameshvara are given in Table 1 and shown in fig. 1a and 1b.

Table 1

	Aditya	*Latitude*	*Longitude*
1.	Lolarkaditya	25° 17' 29.1"	83° 00' 21.4"
2.	Vimladitya	25° 18' 25.1"	83° 00' 16.8"
3.	Karnaditya	25° 18' 24.9"	83° 00' 37.3"
4.	Vriddhaditya	25° 18' 34.2"	83° 00' 43.1"
5.	Draupadaditya	25° 18' 38.1"	83° 00' 37.0"
6.	Gangaditya	25° 18' 34.9"	83° 00' 48.1"
7.	Sambaditya	25° 18' 43.9"	83° 00' 10.5"
8.	Yamaditya	25° 18' 43.7"	83° 00' 58.4"
9.	Mayukhaditya	25° 18' 53.1"	83° 01' 02.8"
10.	Arunaditya	25° 19' 09.7"	83° 01' 24.0"
11.	Khakholaditya	25° 19' 12.8"	83° 01' 21.4"
12.	Keshavaditya	25° 19' 44.7"	83° 02' 34.8"
13.	Sumantvaditya	25° 19' 37.3"	83° 01' 12.2"
14.	Uttararkaditya	25° 20' 04.4"	83° 00' 41.2"
	Madhyameshvara	25° 19' 16.1"	83° 00' 51.0"

It may be noted in (Fig. 1 a & b) that 10 out of the 14 Adityas lie close to the sides of an approximate right triangle formed by Uttaraka, Karnaditya, and Khakholaditya. The longest side (the hypotenuse) is established by the north-south line connecting Karnaditya with the "northern sun" Uttaraka. The two other sides of the triangle have lengths of 2001 m and 1997 m, equal to within 0.2%. The agreement of these two lengths suggests a purpose and care in the planning of the sun temples. One side of the Aditya triangle is tangent to the major section of the *ghats*, extending from Dashashvamedha to Panchaganga *ghats*. Since the line is parallel to the north-flowing Ganga we are tempted to identify this direction as "Kashi north", in contrast to the hypotenuse which is close to "Cosmic north." The line of regression fitted to the six Adityas that comprise that side

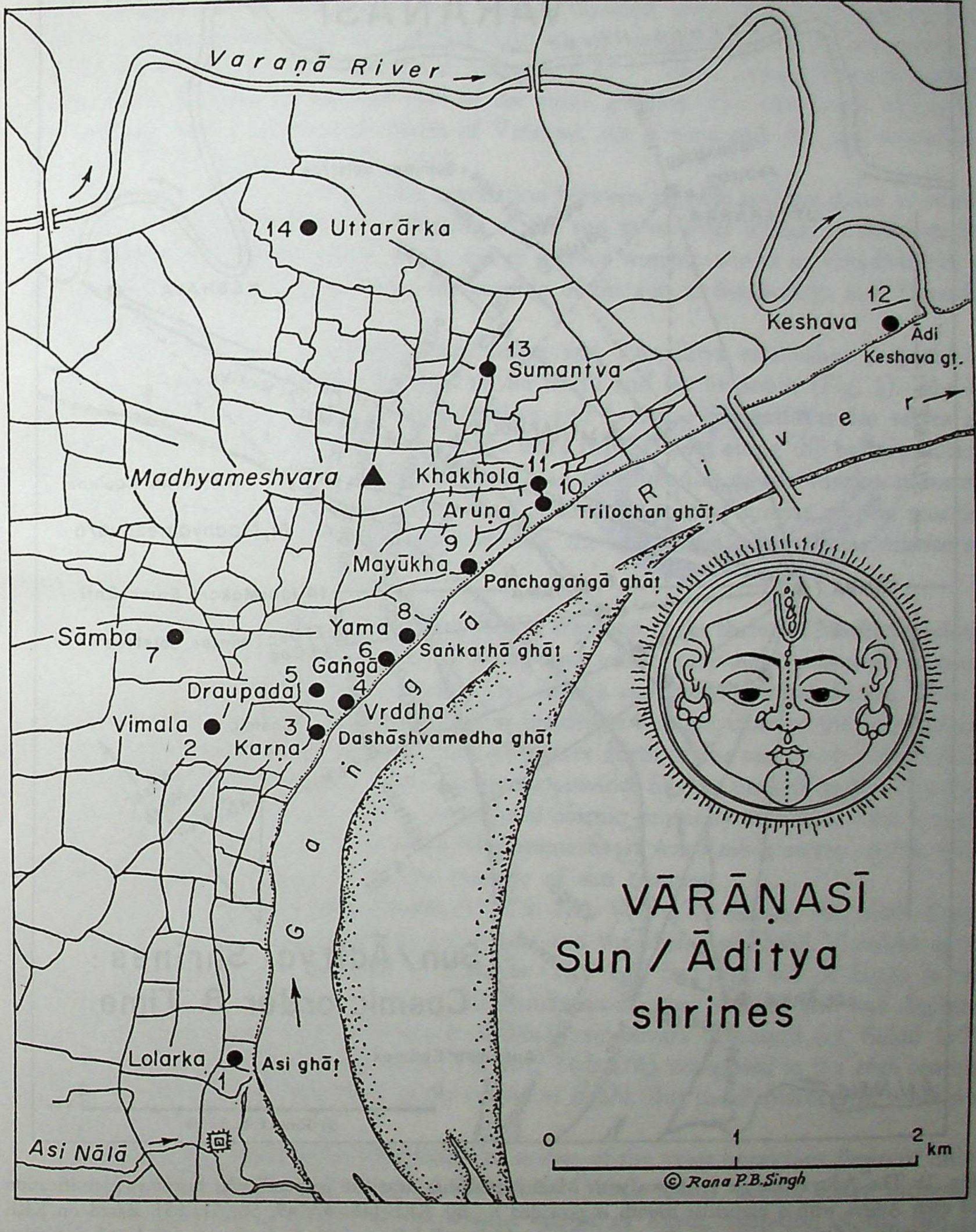

Varaṇā River
14 Uttarārka
12 Keshava
Ādi Keshava gt.
13 Sumantva
River
Madhyameshvara
11 Khakhola
10 Aruṇa
Trilochan ghāṭ
9 Mayūkha
Panchagaṅgā ghāṭ
8 Yama
Sāmba 7
6 Gaṅgā
Saṅkaṭhā ghāṭ
5 Draupada
4 Vṛddha
Vimala 2
3 Karṇa
Dashāshvamedha ghāṭ
Gaṅgā
VĀRĀṆASĪ
Sun / Āditya shrines
Lolarka 1
Asi ghāṭ
Asi Nālā
0 1 2 km
© Rana P.B. Singh

Fig. 1a Map of the Adityas

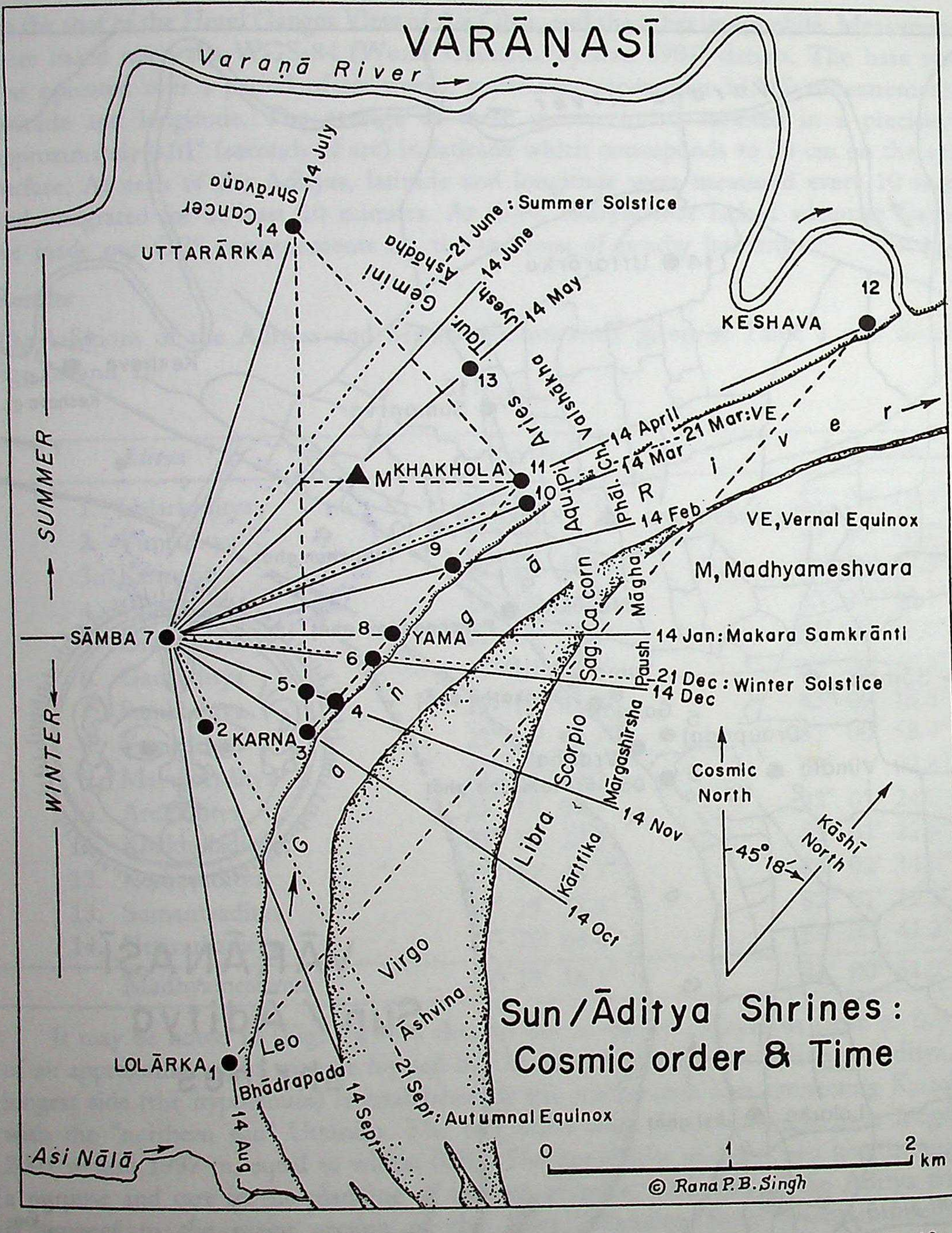

VĀRĀṆASĪ
Varaṇā River →
14 July
Shrāvaṇa
14 Cancer
UTTARĀRKA
21 June : Summer Solstice
Ashāḍha
Gemini
14 June
Jyesh.
Taur.
14 May
Vaishākha
13
Aries
14 April
21 Mar:VE
14 Mar
Ch.
Aqu.
Pi.
Phāl.
14 Feb
KESHAVA
12
R i v e r
VE, Vernal Equinox
M, Madhyameshvara
M KHAKHOLA 11
10
9
SUMMER
SĀMBA 7
8 YAMA
14 Jan: Makara Samkrānti
Māgha
Ca. corn
Sag.
Paush
21 Dec : Winter Solstice
14 Dec
6
5
4
2
KARṆA 3
WINTER
Scorpio
Mārgashīrsha
14 Nov
Cosmic North
45° 18′
Kāshī North
Libra
Kārttikā
14 Oct
G a ṅ g ā
Virgo
Āshvina
Leo
LOLĀRKA 1
Bhādrapada
14 Aug
14 Sept
21 Sept : Autumnal Equinox
Sun / Āditya Shrines : Cosmic order & Time
Asi Nālā
0 1 2 km
© Rana P.B. Singh

Fig. 1b The Aditya triangle is shown with Madhyameshvara near the perpendicular bisector. Identification of each Aditya with a particular month is provided by the KKh (46, 47, 49, 50, 51, 85). Based on KKh (48) Samba Aditya is drawn as the centre from which radial lines demark the associated Hindu months.

of the triangle has an azimuth of 45.9° with a standard error of 1.8°. It may be noted that the corresponding angle in a perfect right triangle would be 45°. The line connecting Lolarka Kunda and Keshavaditya has an azimuth of 45.5°. These two Adityas are identified in the *Kashi Khanda,* as the two eyes of the earth goddess. The two rivers which form the northern and southern boundaries of Varanasi, the Varana and Asi, are described as the arms of the goddess (KKh. 7.66).

There is a hint of a north-south correlation between latitude and the dates of worship of the sun in the *Kashi Khanda.* Worship of the sun at summer solstice is recommended at Arunaditya and Keshavaditya, while winter solstice worship occurs at Vriddhaditya and Lolarka. The most auspicious dates for worship of the sun at Sambaditya and Yamaditya are at equinox.

The east-west line connecting Sambaditya and Yamaditya establishes a spatial and temporal dividing line for the Adityas: six lie north and six lie south (Fig. 1). The line lies halfway in latitude between Uttararkaditya and Lolarka. Sambaditya also serves as a symbolic focus of sight lines for viewing the sun's rising points along the eastern horizon. The line to Keshavaditya and Khakholaditya is in the direction of the sunrise at summer solstice. The direction from Sambaditya to Yamaditya is toward sunrise on the mornings of equinox. Karnaditya and Vriddhaditya straddle the line to the rising winter solstice sun.

Madhyameshvara

When we started our fieldwork, we paid particular attention to the shrine of Madhyameshvara, which had been the original centre of Kashi and which may have possessed a special relationship to the original sun temples. Our results confirmed this prediction. Note in Fig. 1 that the shrine of Madhyameshvara lies inside the triangle, close to the perpendicular bisector of its longest side. The shrine lies 45 metres north of the midpoint of the 2,452m north-south side of the triangle. Such agreement provides further support to the hypothesis that the Aditya right triangle was an intentional cosmic geometry of Kashi. Such a spatial pattern may have been established when Madhyameshvara was Kashi's sacred centre, which was surrounded and protected by the triangle of sun temples.

The *Padma Purana: Patala Khanda* (cf. TS: 100; VM: 175) defines the *Kashi Kshetra* by a circle with Madhyameshvara at the centre and the shrine of Dehli Vinayaka as the western radial point at a distance of 5 *krosha* (16.8 km) (see Fig. 6.3 of Singh in this volume). During the course of time, as the Panchakroshi grew smaller and was displaced from its original centre, the importance of Madhyameshvara decreased (cf. Sukul 1975: 155). In the *Brahmavaivarta Purana* (cf. TS: 101; VM: 176), composed in the 16th century, Madhyameshvara is still identified as the centre of Kashi. But the Panchakroshi route was reduced in size.

Many Puranas describe Madhyameshvara as one of the most important *lingas* of Shiva (cf. *Kurma* 1.32.12; 1.34.1-2; *Linga* 1.92;91.135). While many people today recognize Madhyameshvara as the centre of the cosmic circuit of Kashi, visitation of the site by pilgrims is not common.

ADITYAS IN TEXT AND ICON (FROM NORTH TO SOUTH)

1. *Uttararka*, the Northern Sun (Pl. 6.3 & Fig. 2)

The northernmost Aditya, Uttararka is on the eastern edge of the Bakaria Kunda, just south of the Grand Trunk Road in northern Varanasi. Little remains of the grandeur of the original *kunda* and its complex of temples, which were either demolished or transformed into Muslim buildings. Originally the lake was called Arka Kunda. The name Bakrari is derived from a goat (Bakrari is also one of the names of Krishna), who never lost interest in worshipping the sun. Eventually, by imitating the devotions to the sun practised by a Brahmin girl, the goat obtained the power of the sun (KKh 47.56).

According to the *Kashi Khanda,* one should worship the sun on days in *Paush* (December and January). Other folk traditions associated with the site involve worship of the sun on Sundays in *Jyeshtha* (May and June) (KKh 47.57). Muslims have also developed a festival of marriage, Gazimiyan, which is celebrated on Sundays in *Jyeshtha.*

Uttaraka protects Kashi on its northern side by means of the "sun's strongest rays." These rays give blessing to people and take all of their sufferings away. The "strong" radiation attributed to the northern sun is probably a reference to the intense solar radiation experienced by pilgrims to Mt. Kailash in the Himalayas to the north (KKh 47.2). Uttaraka also protects one from poverty (KKh 47.60).

The very impressive icon of Uttararka, contained in a locked modern enclosure, consists of a 1.62-metre tall *yupa* or *lingam,* with 16 lotus buds two-thirds of the way up its side, and 24 petals near its top.

2. *Keshavaditya:* Keshava's Sun (Fig. 3)

The disk of the sun at the Adi Keshava temple has the combined power of seven days of the sun (KKh 51.45). At this site, one can get relief from all kinds of sins and ultimately be loved by Lord Shiva (KKh 51.75), and in June and July, on the 7th day of the bright half, worshipping the sun has the most merit. In the end of June, near summer solstice and especially on Sundays, worship is especially powerful (KKh 51.76). There are five images of the sun in the Adi Keshwara temple, each facing east across the Ganga.

3. *Sumantvaditya*: Sumantva's Sun (Fig. 2)

The sage Sumantva developed leprosy, and this Aditya provides relief from leprosy and other diseases of the skin (KKh 65.6). The icon of Sumantvaditya is a well-preserved carved image, approximately 40 cm across, displaying Surya holding a sword in his right hand and a lotus in his left. He is depicted riding his chariot, carried forward by Aruna and seven horses.

4. *Khakholaditya/Vinitaditya*: Vinita's Sun (Fig. 3)

The fascinating and complex story associated with Vinitaditya contains hints of a number of astronomical phenomena that may have been witnessed by the inhabitants of the city. Two daughters of Daksha, Kadru and Vinita, became involved in a friendly competition

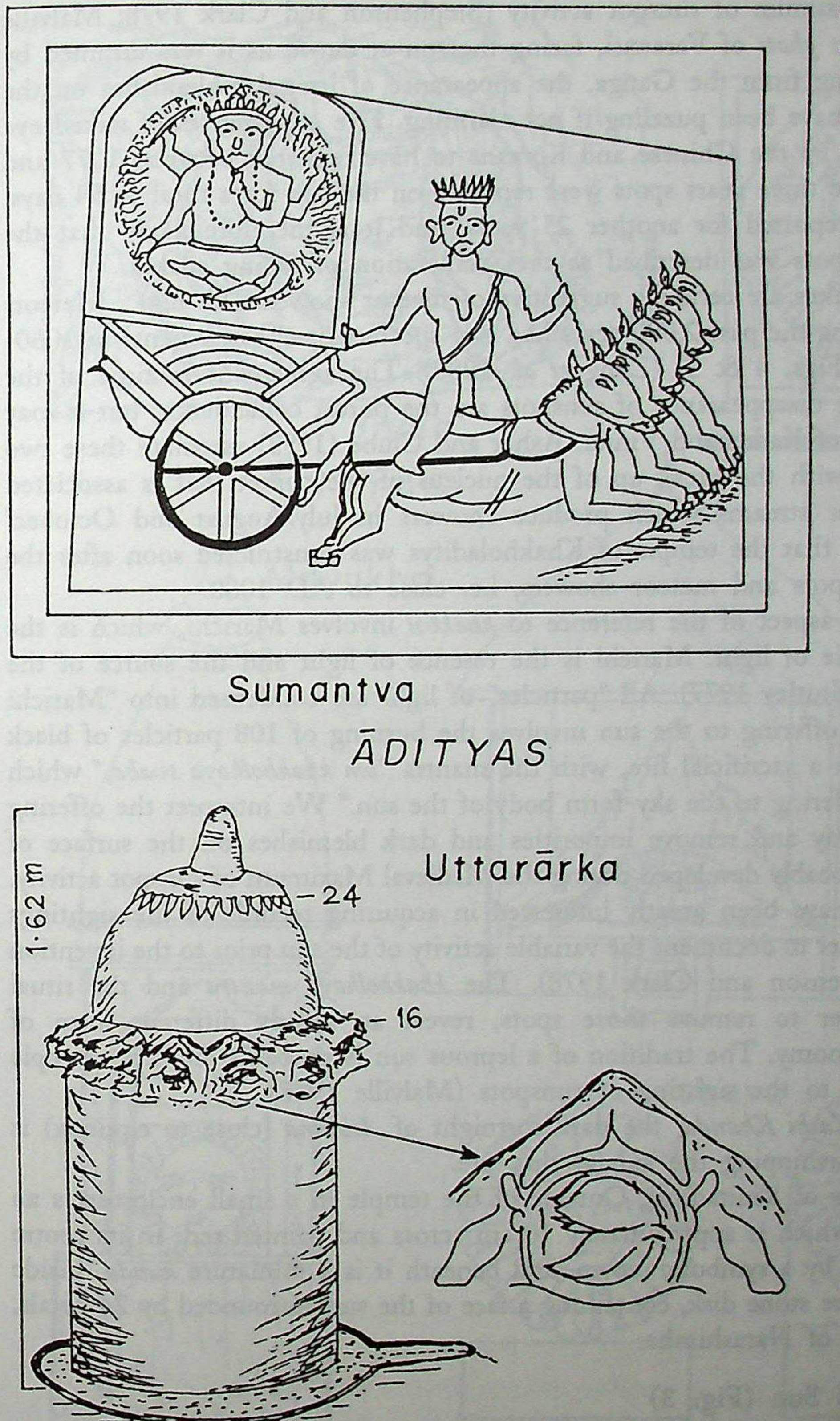


Fig. 2 Uttararka and Sumantva

as to who could better describe the face of Surya, i.e. the visible disk of the sun. Kadru, who was the mother of the *nagas*, sent her snakes up to the sun to produce spots on its visible surface and thereby cause her sister to err (KKh 50. 17). The sun became disturbed and hot. Vinita was the mother of the birds, including Garuda, and could easily combat snakes. Perhaps pretending to be afraid that she would lose the contest or to be affected by the hot sun, Vinita uttered the stuttering-like sound *khakhol; kha* also means sky. The sound caused the snakes to leave the sun, falling in flames, and the face of the sun was cleared of spots (KKh 50.39).

The presence of coiled dark snakes on the sun is almost certainly a reference to sunspots that were large enough to be visible to the unaided human eye. Between AD 1077 and 1275, there occurred the greatest recorded out break of sunspots visible to the unaided eye, the so-called Medieval Maximum of sunspot activity (Stephenson and Clark 1978; Malville 1988). Especially at the *ghats* of Varanasi, facing the sun at dawn, as it was dimmed by the morning mists rising from the Ganga, the appearance of irregular blemishes on the face of the sun would have been puzzling if not alarming. Five appearances of naked eye sunspots were reported by the Chinese and Koreans to have occurred between 1077 and 1079 AD. During those three years spots were reported on the sun for a total of 54 days. No more spots were reported for another 25 years, and it is therefore likely that the disappearance of the spots was described as the incineration of falling snakes.

Falling flaming snakes are certainly suggestive of meteor showers (Pl. 6.4) . Meteors observed in China during the past 2,000 years had two spectacular enhancements in 1060-80 and AD 1440-80 (Figs. 4 & 5) (Zong *et al.* 1988). The agreement in time of the meteor showers and the disappearance of sunspots are the purest coincidence, but it may have inspired the story of Kadru and Vinita. Asher and Clube (1993) associate these two major meteor showers with the break-up of the nucleus of the comet that is associated with the Taurid meteor streams which produce showers in July/August and October/November. We suggest that the temple of Khakholaditya was constructed soon after the appearance of the sunspots and meteor showers, i.e. close to AD 1080.

Another important aspect of the reference to *khakhol* involves Marichi, which is the Vedic term for a particle of light. Marichi is the essence of light and the source of the luminosity of the sun (Stutley 1977). All "particles" of light are condensed into "Marichi of seven rays." A ritual offering to the sun involves the burning of 108 particles of black pepper called *marichi*, in a sacrificial fire, with the mantra "*om khakholkaya svaha,*" which may be translated as "offering to the sky-form body of the sun." We interpret the offering as designed to burn away and remove impurities and dark blemishes on the surface of the sun. The offering probably developed during the Medieval Maximum of sunspot activity.

Solar astronomers have been greatly interested in acquiring records of the sightings of naked eye spots in order to document the variable activity of the sun prior to the invention of the telescope (Stephenson and Clark 1978). The *khakholkaya mantra* and the ritual burning of black pepper to remove those spots, reveal an utterly different form of observational solar astronomy. The tradition of a leprous sun is probably another example of the human response to the sighting of sunspots (Malville 1988).

According to the *Kashi Khanda*, the dark fortnight of *Ashvina* (close to equinox) is the proper time for worshipping the sun at this site.

There are two icons of Vinitaditya. Outside of the temple in a small enclosure is an unusual irregular mass which is approximately 10 cm across and painted red. In its centre is a circle. It is covered by a symbolic crown, and beneath it is a miniature *kunda*. Inside there is a 50-cm diametre stone disk, containing a face of the sun surrounded by 24 petals, flanked by two images of Narashimha.

5. *Arunaditya*: Aruna's Sun (Fig. 3)

According to the *Kashi Khanda*, the sun takes the longest time to be at this site, and

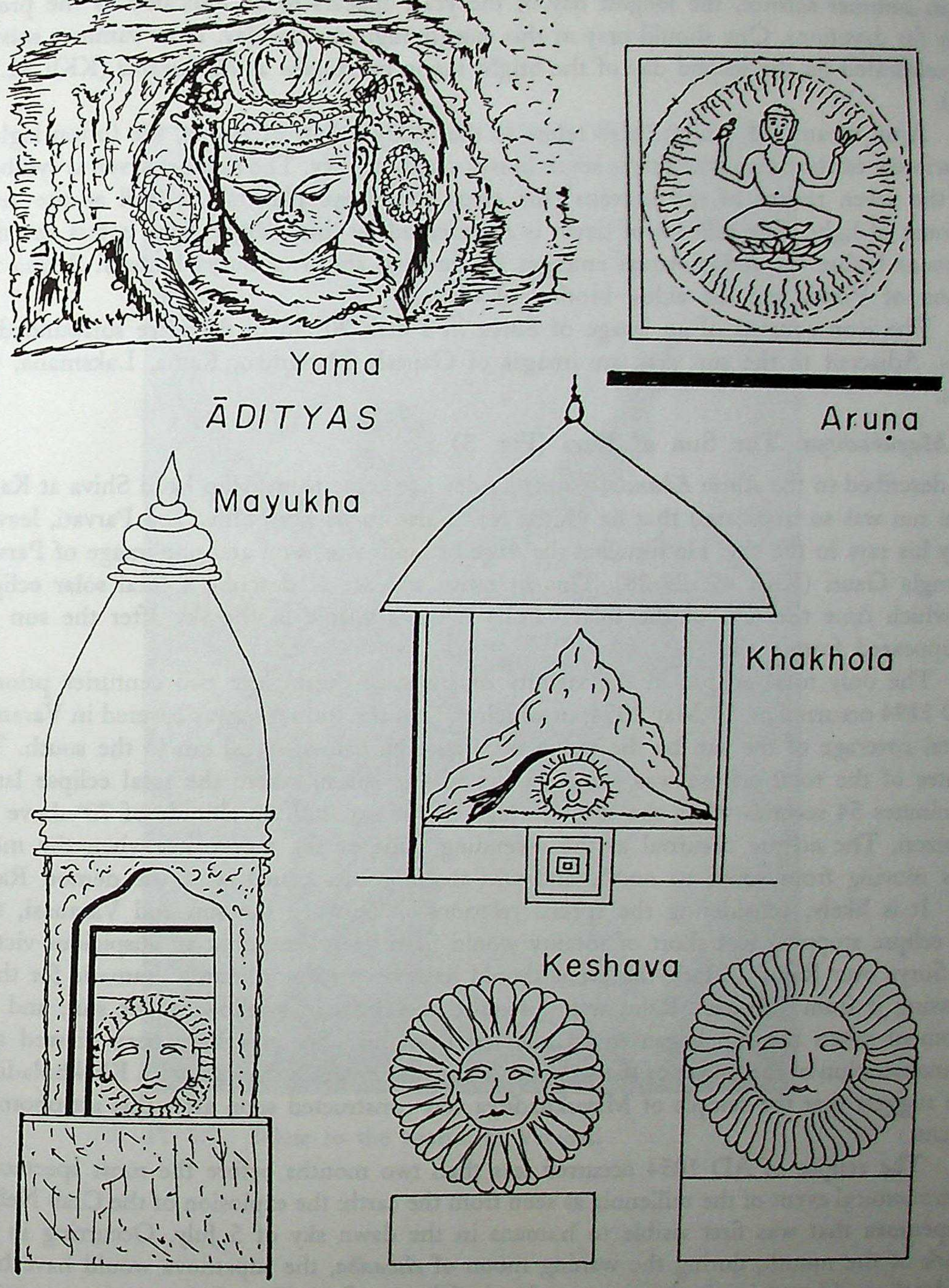

Yama
ĀDITYAS
Aruṇa
Mayukha
Khakhola
Keshava

Fig. 3 Adityas: Yama, Aruna, Mayukha, Khakhola, and Keshava

thus summer solstice, the longest day of the year, appears to be indicated as the proper day for devotions. One should pray at this site throughout that day. Now summer solstice is celebrated on the second day of the bright moon on *Asadha* as *Rathayatra* (KKh 51.21-26).

Arun means red sun and also refers to the ruddy colour of Aruna, the (often legless) charioteer of the Surya who drives seven horses across the sky. The number seven is symbolic of the seven realms of the heavens (the seven naked eye planets), as well as the seven colours of light. The fullness of dawn is represented by this Aditya: light enters the dark heavens before the ruddy Aruna emerges in the east, ahead of Surya himself. Aruna was a son of Vinita and the eldest brother of Garuda.

The icon consists of an image of Surya in a disk 20 cm in diametre surrounded by rays. Adjacent to the sun disk are images of Ganesh, Hanuman, Rama, Laksmana, and Sita.

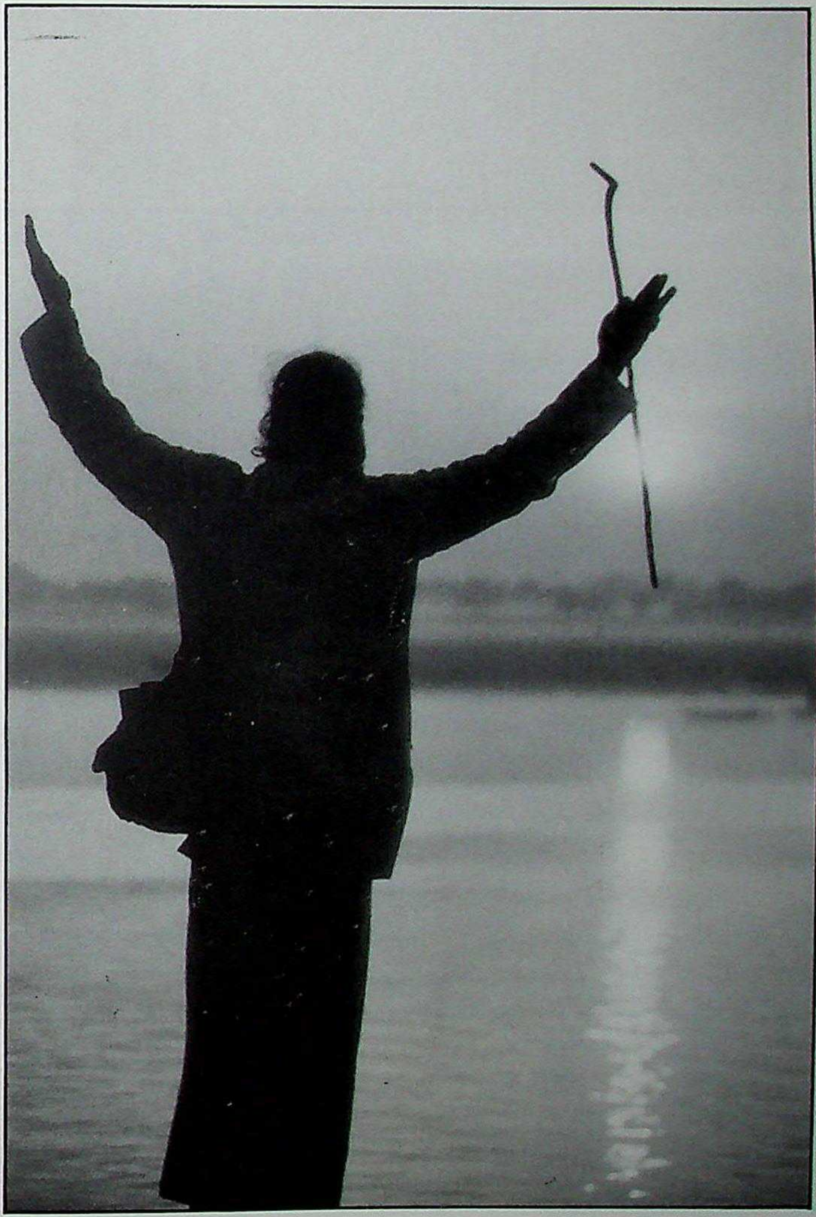
6. *Mayukaditya*: The Sun of Rays (Fig. 3)

As described in the *Kashi Khanda*, a wealthy devotee came to worship Lord Shiva at Kashi. The sun was so impressed that he visited Kashi also to worship Shiva and Parvati, leaving only his rays in the sky. He installed the *linga* of Gabhastishvara and one image of Parvati, Mangla Gauri (KKh 49. 26-28). This narrative appears to describe a total solar eclipse, at which time the rays of the solar corona remains visible in the sky after the sun has disappeared from view.

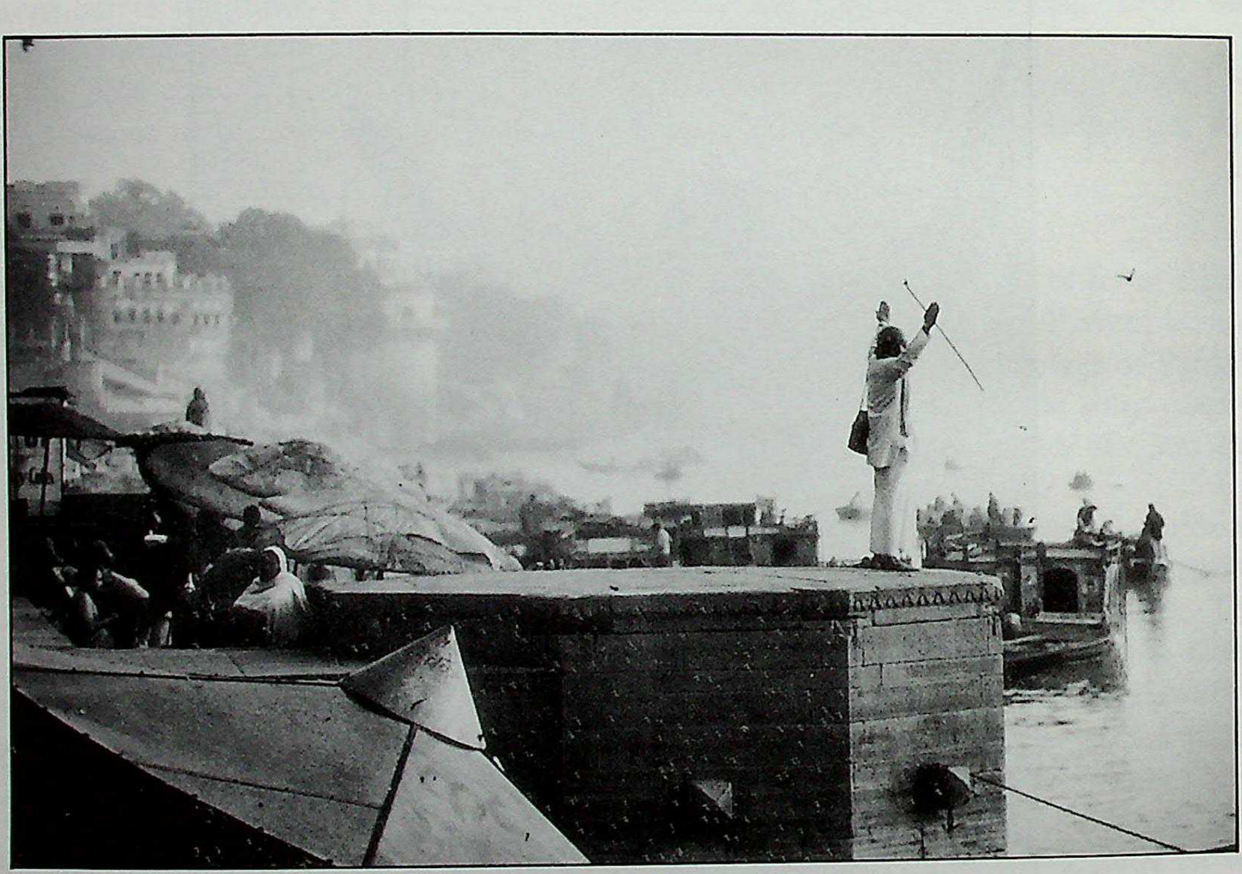
The only total eclipse in the vicinity of Varanasi during the two centuries prior to AD 1194 occurred on 10 May 1054, in which 98% of the sun's disc was covered in Varanasi. Total coverage of the sun by the moon occurred approximately 20 km to the south. The centre of the total eclipse was some 75 km to the south, where the total eclipse lasted 2 minutes 54 seconds when the sun was high in the sky with an altitude of 70° above the horizon. The eclipse occurred at the ascending node of the moon, i.e. when the moon was moving from south to north, and was therefore associated with the demon Rahu.

It is likely, considering the special relationship between the sun and Varanasi, that an eclipse stopping just short of totality would have been viewed as an auspicious victory of Surya over Rahu. In fact, the event should have been extraordinarily dramatic for those viewing it from Varanasi. Rahu was not quite successful in swallowing the sun, and the moment when the sun began to be released from his jaws may have been viewed as a demonstration of the power of the sun over his adversary. As is the case with Khakholaditya, we suggest that the temple of Mayukhaditya was constructed soon after this astronomical event.

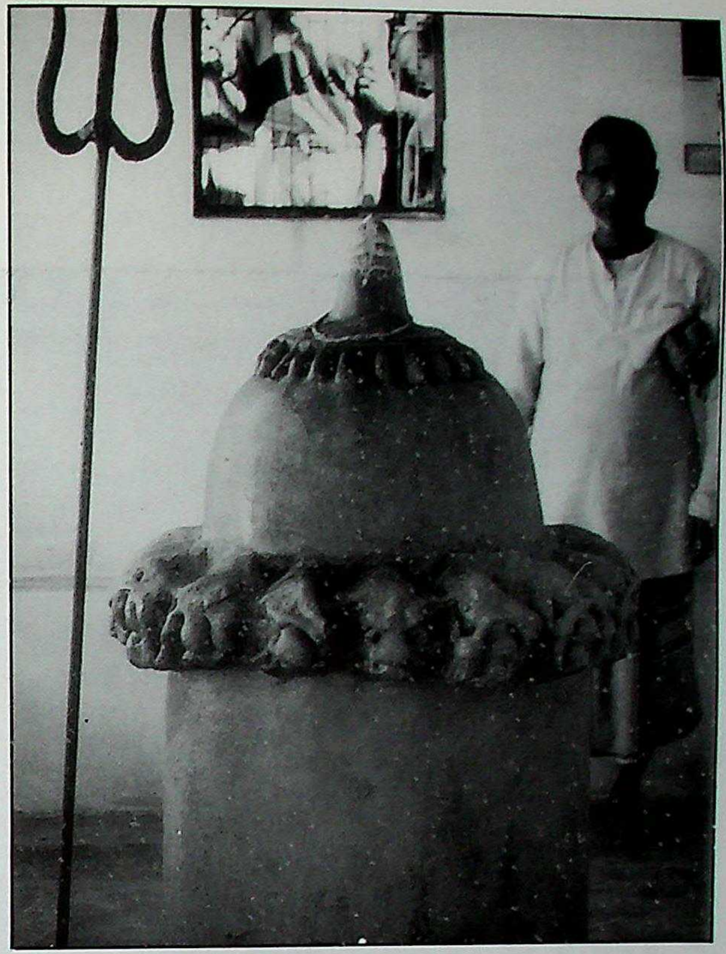
The eclipse of AD 1054 occurred less than two months before the most spectacular astronomical event of the millennia as seen from the earth: the explosion of the Crab Nebula supernova that was first visible to humans in the dawn sky of 5 July. Occurring in the dark of the month, during the waning moon of *Ashadha*, the supernova would have been a dazzling object rising in the east just ahead of the sun. Its brilliant light may have acquired



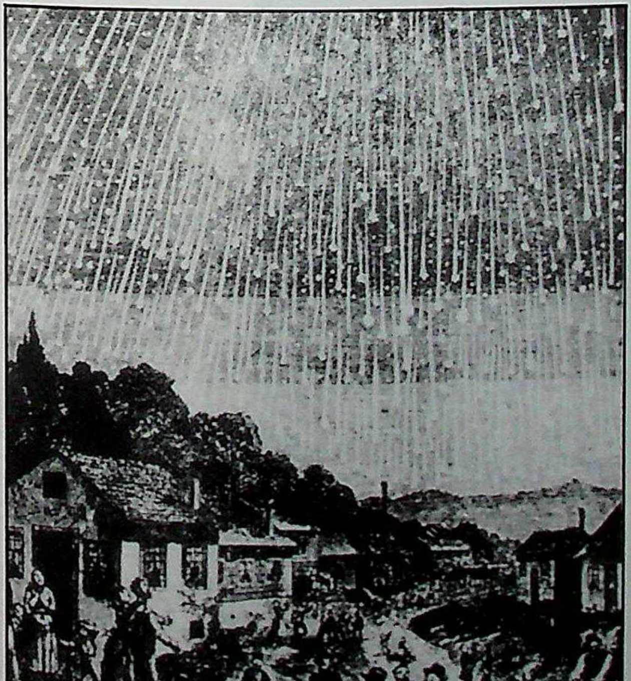
Pl. 6.1 Salute to the sunrise in Varanasi



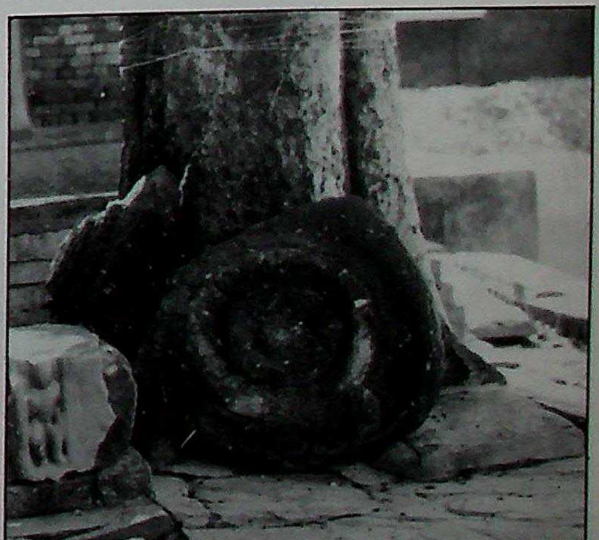
Pl. 6.2 Salute to the sunrise in Varanasi



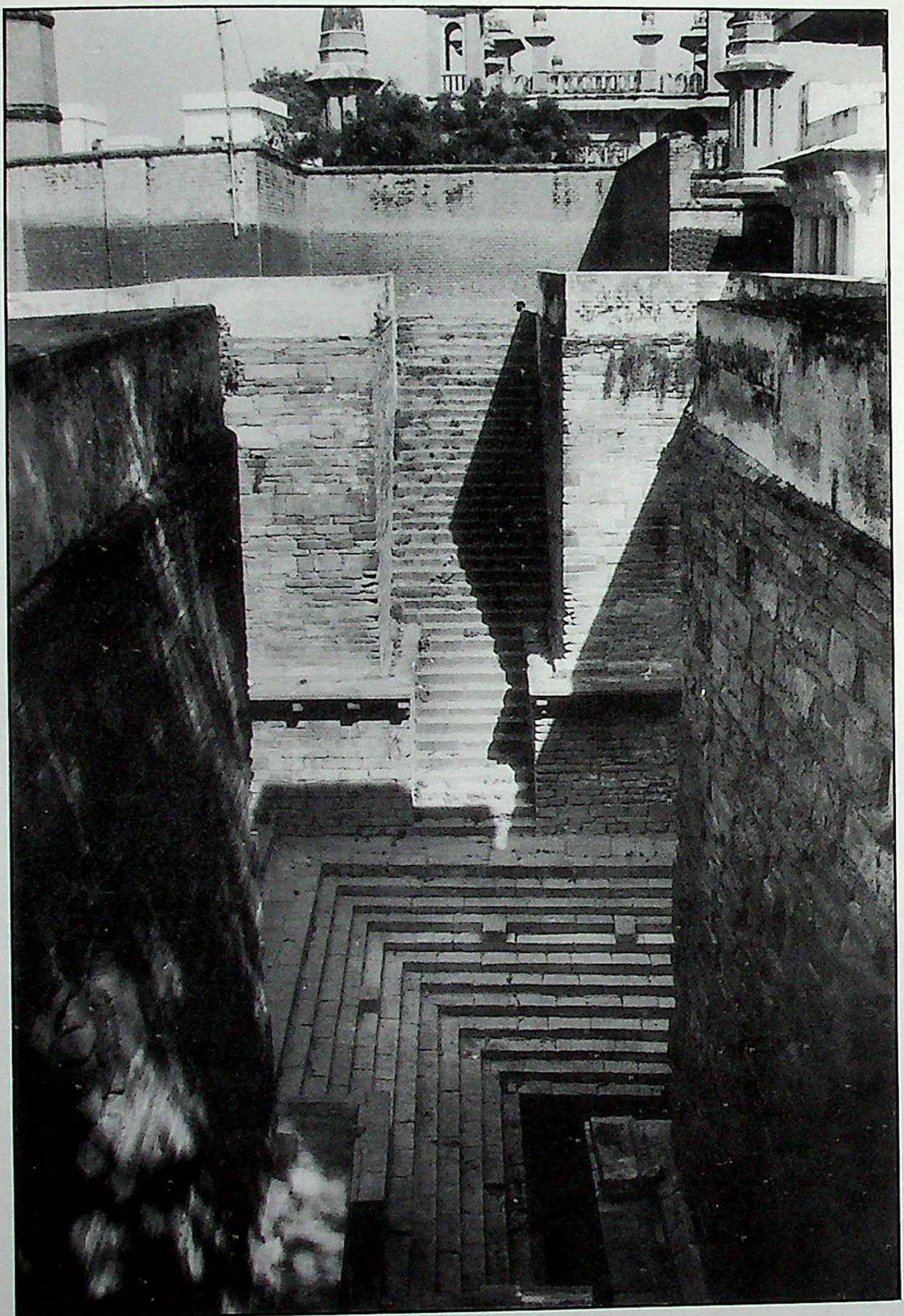
Pl. 6.3 A scene of Uttararka



Pl. 6.4 Artist's depiction of the Leonid meteor shower of November 12, 1833.



Pl. 6.5 Sun disks and images at the foot of the bo-tree, near Sambaditya



Pl. 6.6 Lolarka Kunda, a water pool assoicated to Sun god

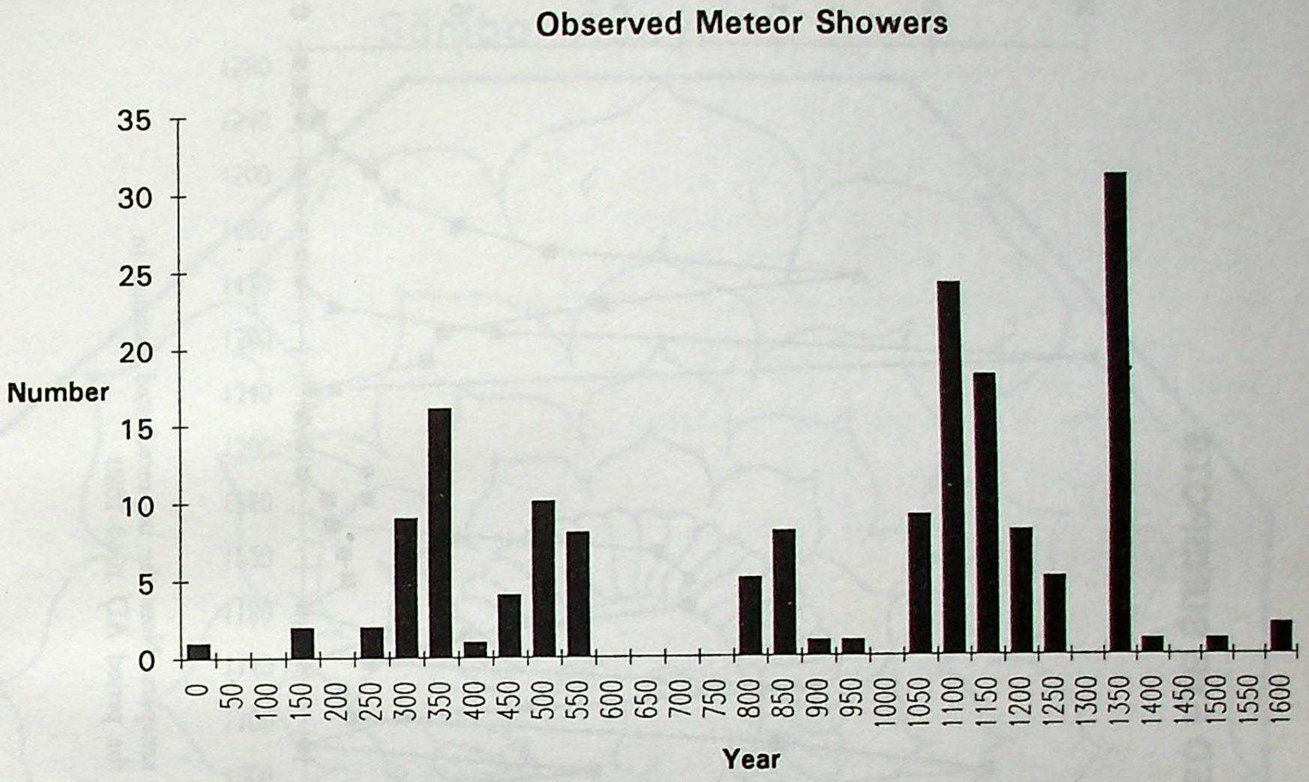


Fig. 4 Meteor showers observed in China from AD 0 to AD 1600.
Note the two major enhancements in AD 1060-1080 and AD 1140-1480

symbolic importance among the inhabitants of Kashi, but we have yet to locate any textual allusions to the supernova.

Lord Shiva himself gave power to Surya, in the form of Mayukaditya, such that those who worship at the shrine would never suffer from poverty (KKh 49.93).

The icon of Mayukhaditya is contained in the Mangla Gauri temple and consists of a small disk set in a pillar, containing the sun's face surrounded by rays.

7. *Sambaditya*: Samba's Sun (Fig. 6)

Samba, the son of Krishna, was considered to be very handsome, but because of his proud nature he did not show proper respect to the sage Narada. Narada laid a trap for him by arranging for Samba to visit his father at a time when he was with his wives. Because he disturbed his father, Krishna cursed him to develop leprosy (KKh 48.10).

Samba was advised by Krishna that he could be cured if he came to Kashi and installed an image of Surya (KKh 48. 40), which he did at the Surya Kunda (KKh 48.46). Appropriately, worshipping the sun at Sambaditya relieves one of all forms of skin diseases (KKh 48.48).

The light fortnight of *Magha* (January and February) is the recommended time for worshipping the sun on Sundays. If a solar eclipse falls on one of these Sundays, then

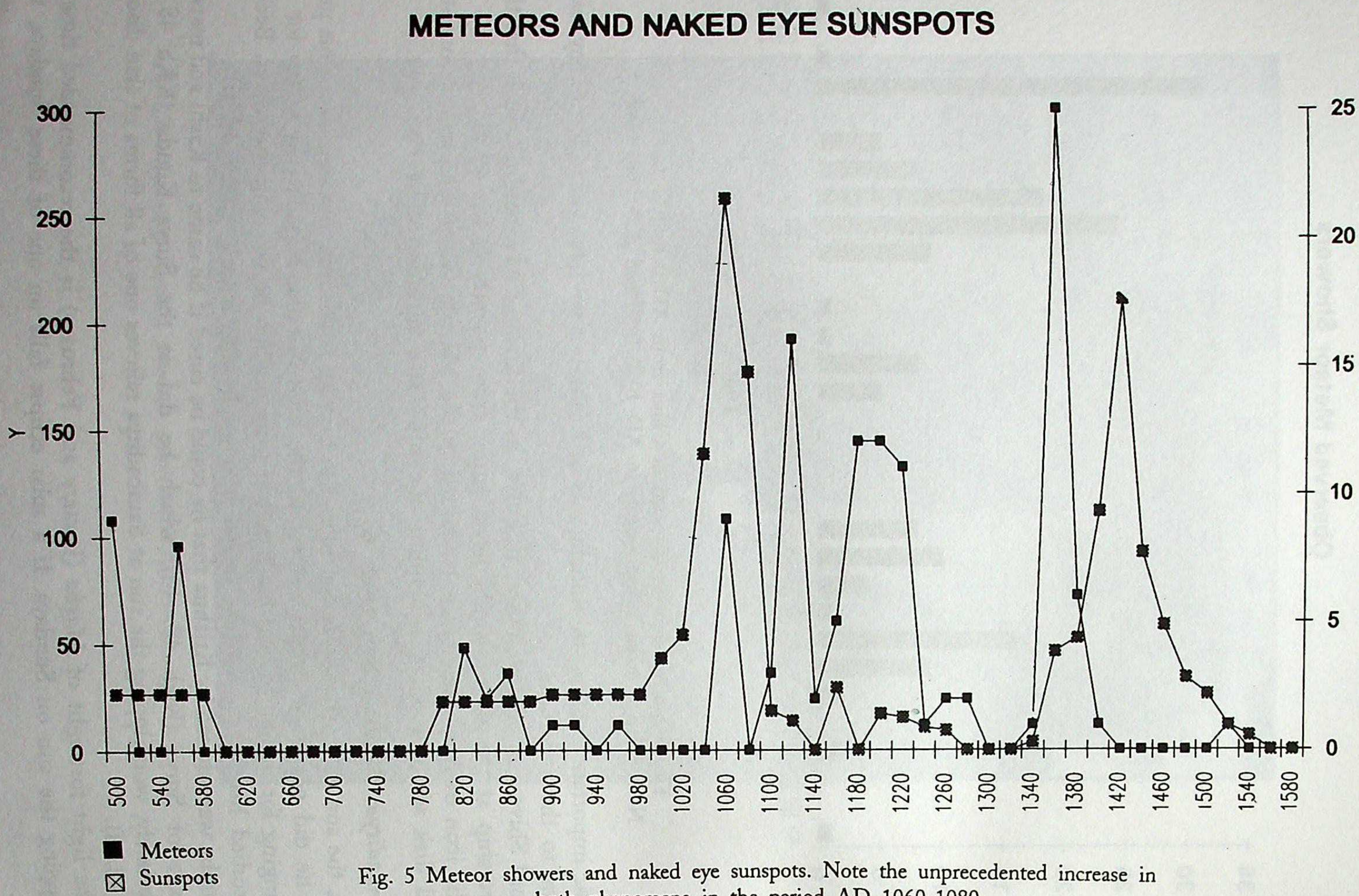


Fig. 5 Meteor showers and naked eye sunspots. Note the unprecedented increase in both phenomena in the period AD 1060-1080

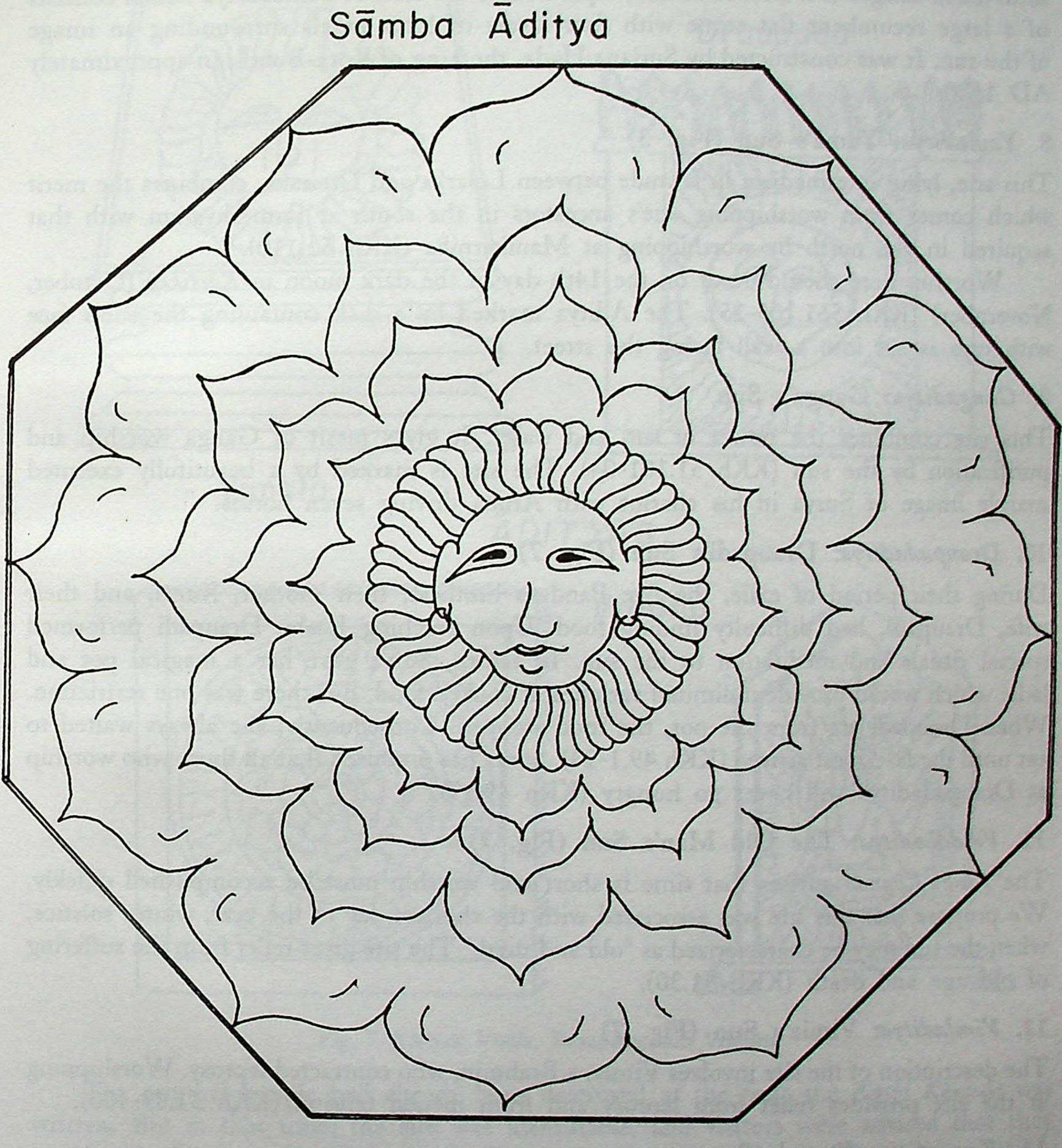


Fig. 6 Sambaditya

worshipping the sun at that time provides infinite power and merit (KKh 48.48, 52).

The *Linga Purana* (KKT: 44, 48) describes the site and its glory. Sheering (1968:127) believes that there were 12 wells dedicated to Surya at the site, but they have all been lost. Near the *ghat,* at the western end of the *kunda,* there are two carved disks with lotus-form images (Pl. 6.5). A small temple houses the icon of Sambaditya which consists of a large recumbent flat stone with four layers of lotus petals surrounding an image of the sun. It was constructed by Surjana Hada, the king of Kota-Bundi, in approximately AD 1580.

8. *Yamaditya*: Yama's Sun (Fig. 3)

This site, lying intermediate in latitude between Lolarka and Uttaraka, combines the merit which comes from worshipping one's ancestors in the south at Rameshvaram with that acquired in the north by worshipping at Manikarnika (KKh 51.110).

Worship here should occur on the 14th day of the dark moon in *Kartikka* (October, November) (KKh 561.105-15). The Aditya marked by a disk containing the sun's face with rays is set into a wall facing the street.

9. *Gangaditya*: Ganga's Sun

This site combines the power of sun and water. It gives merit of Ganga worship and purification by the sun (KKh 51.101-04). The site is marked by a beautifully executed marble image of Surya in his chariot with Aruna driving seven horses.

10. *Draupadaditya*: Draupadi's Sun (Fig. 7)

During their period of exile, the five Pandava brothers, their mother, Kunti, and their wife, Draupadi, had difficulty finding food. Upon reaching Kashi, Draupadi performed special rituals and meditation to the sun. In return, Surya gave her a magical pot and ladle which would provide unlimited varieties of cooked food. But there was one restriction. When Draupadi ate from the pot, the food stopped. Consequently, she always waited to eat until the last guest arrived (KKh 49.1-24). Surya has promised that all those who worship at Draupadaditya will never go hungry (KKh 49.19).

11. *Vriddhaditya*: The Old Man's Sun (Fig. 7)

The *Kashi Khanda* advises that time is short and worship must be accomplished quickly. We propose that this site was associated with the shortest day of the year, winter solstice, when the sun may be characterized as "old and tired." The site gives relief from the suffering of old age and death (KKh 51.30).

12. *Vimladitya*: Vimla's Sun (Fig. 7)

The description of the site involves Vimla, a Brahmin, who contracted leprosy. Worshipping at the site provides relief from leprosy and from mental tension (KKh 51.83-100).

13. *Karnaditya*: Karna's Sun

Karna, the son of Surya and Kunti, a major figure of the *Mahabharata*, was distinguished by his unlimited generosity. His willingness to give whatever was asked of him led to his death at the hands of Arjuna. This Aditya symbolizes the unlimited generosity of the sun, which provides, without surcease, the energy needed by life on the earth.

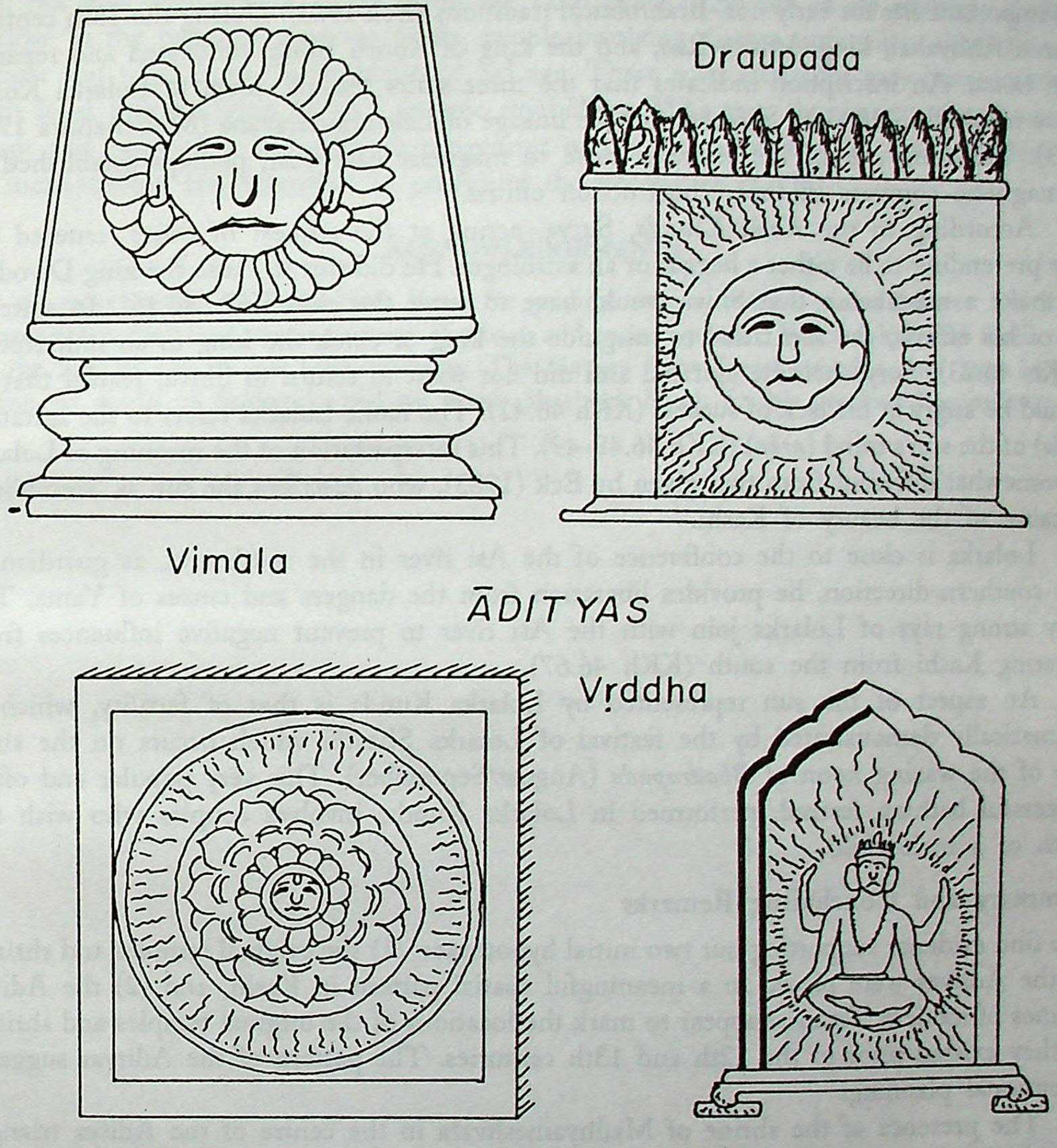


Fig. 7 Adityas: Vimla, Draupada, and Vriddha

The original temple had already been destroyed at the time the *Kashi Khanda* was written. But at that time, the site was identifiable, and visitors were advised that they could still obtain merit (KKh 85.45). The site is important for it defines the southern apex of the Aditya triangle. An image of Surya in his chariot is contained in the Rama temple, some 50 metres west of Dashashvamedha Ghat.

14. *Lolarka*: The Agitated Sun (Pl. 6.6)

Lolarka Kunda is one of the most ancient sacred spots in Varanasi and may have been an important site for early non-Brahminical traditions (Eck 1983). During the 18th century, queen Ahilyabai, king Amrita Rao, and the king of Kooch Bihar, renovated and repaired the *kunda*. An inscription indicates that the three stairs leading down to Lolarka Kunda were repaired in 1843 by Shivendra of the lineage of Lakshminarayana (Motichandra 1985: 373). The long axis of the *kunda* is close to magnetic east-west, perhaps established by a magnetic compass in the reconstruction efforts.

According to the *Kashi Khanda*, Surya, acting at the request of Shiva, entered the city pretending to be either a beggar or an astrologer. He did this to cause the king Divodasa to make a mistake so that Shiva would have to enter the city (KKh 46.15). In spite of all of his efforts, the sun failed to misguide the king or catch the king in an indiscretion (KKh 46.23). Surya became agitated and did not want to return to Shiva, fearful that he would be angry at his lack of success (KKh 46.42). The name Lolarka refers to the agitation (*lola*) of the sun's mind (*arka*) (KKh 46.48-49). This interpretation of the meaning of Lolarka is somewhat different from that given by Eck (1983), who describes the sun as "trembling" because of the beauty of Kashi.

Lolarka is close to the confluence of the Asi river in the south and, as guardian in the southern direction, he provides liberation from the dangers and curses of Yama. The very strong rays of Lolarka join with the Asi river to prevent negative influences from entering Kashi from the south (KKh 46.67).

An aspect of the sun represented by Lolarka Kunda is that of fertility, which is dramatically demonstrated by the festival of Lolarka Shasthi which occurs on the sixth day of the waxing noon of *Bhadrapada* (August/September). This very popular and often successful bathing festival, performed in Lolarka Kunda, involves couples who wish the birth of a male child.

Summary and Concluding Remarks

We find evidence supporting our two initial hypotheses: (1) the original temples and shrines of the Adityas were placed in a meaningful spatial pattern in Kashi, and (2) the Aditya shrines of modern Varanasi appear to mark the locations of the original temples and shrines as they existed prior to the 12th and 13th centuries. The pattern of the Adityas suggests intentional planning.

The presence of the shrine of Madhyameshvara in the centre of the Aditya triangle provides further evidence of some form of city planning in Varanasi and is of considerable interest in this city which developed largely without the influence of imperial authority. The geometric organization may have been established by influential pandits and wealthy patrons.

The Aditya triangle, with Madhyameshvara in its centre, provides a paradigmatic example of cosmic geometry. It involves all three scales of the cosmos: the macro-scale of the celestial sphere containing the sun and celestial north pole, the meso-scale of the Ganga, and the micro-scale of temples, shrines, ritual, text, and people.

In Varanasi, the sun is directly involved in the life of the city: daily as the dawn sun, but also traditionally, as an agent for Lord Shiva. The sun in its multiple aspects is close to the personal concerns of the people involving disease, infertility, alleviation of hunger and relief from the problems of old age. These solar attributes may have emerged from local folk tradition as well as epic mythology. Whatever the source, the intuition is apt and correct: as the ultimate progenitor of life on the earth, the sun continues to be inexhaustible and bountiful in providing the necessities of life.

ACKNOWLEDGEMENTS

We are most grateful to Kedar Nath Vyasa for guiding us to a number of the Adityas. Dr. B.N. Saraswati has been a continuing source of advice and encouragement. We thank David Robertson for the loan of one of our GPS receivers. The Ganges View Hotel served as our base station during six weeks of fieldwork, and we thank Shashank Singh for his gracious hospitality.

VII

THE COSMIC GEOMETRIES OF VIJAYANAGARA

J.M. Malville

Introduction

With a population that may have reached 500,000 just before its destruction in 1565, Vijayanagara was the capital of the most powerful Hindu empire of medieval India. Built on the southern bank of the Tungabhadra river in a region of great beauty and mytho-historic significance the city contained multiple layers of political, religious, and cosmic symbolism (Fritz 1985, 1989; Malville and Fritz 1993a, 1993b) In this paper I discuss the cosmic geometries of the city, many of which have been revealed and quantified by our recent program of GPS mapping.

This study of cosmic geometries was designed to be all-inclusive and more comprehensive than simply a search for astronomical alignments. The north celestial pole, the sun, and the star Sirius had powerful influences upon the city, but the mesocosm consisting of the Tungabhadra river and the city's four major hills dominated its geometry.

The microcosm of tradition and text also had substantial effects upon the organization of spaces inside and outside the city walls. Traditions involving Pampa, her consort, Virupaksha, and her spiritual father, Matanga, left major imprints, especially in connection with Matanga and Hemakuta hills. If one considers the total landscape of the city, the epic *Ramayana* probably was the most forceful of all. The episodes of Rama's search for Sita that took place in Kishkinda include a remarkable number of specific sites in the vicinity of Vijayanagara. Those that have generated geometrical patterns in the city and its surrounding landscape include the birth place of Hanuman on Anjenadri hill; Malyavanta hill, where Rama and Laksmana remained during the rainy season before proceeding southward to Lanka; Sugriva's cave where the jewels of Sita were hidden; Matanga hill where Sugriva obtained protection from Vali; Chintamani ashram where Rama shot Vali when he and Sugrīva were fighting; and the cremation pyre of Vali at Vali Kasta.

The synthesis of meaning and symbolism that was Vijayanagara must have been designed by numerous kings and planners throughout the 250 year lifetime of the city. The city's geometrical structure reveals the remarkable powers of place and myth in organizing the pattern of urban life.

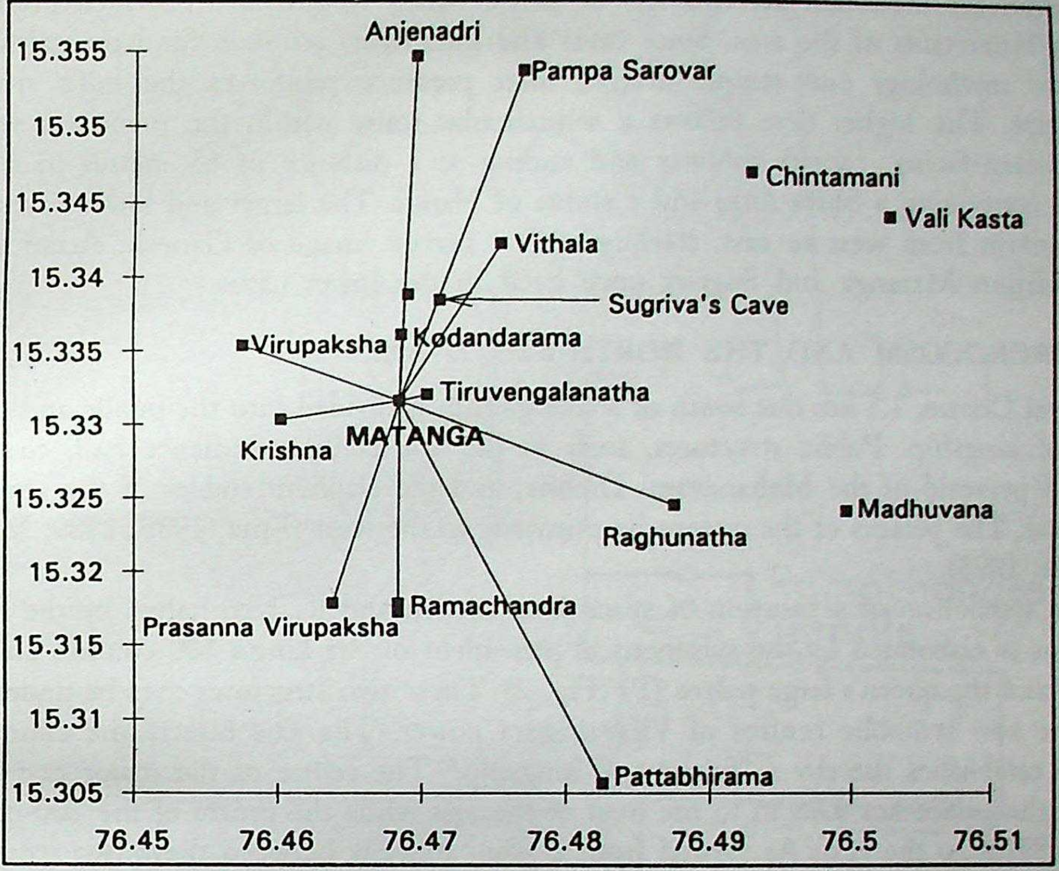


Fig. 1 Matanga hill and major features of Vijayanagara established by GPS measurements

Matanga Hill and Pampa Tirtha

Prior to the founding of the city, and prior even to the journey of Rama southward in search of Sita, the most important deity in the area was the goddess, Pampa. The area was known as Pampa-*tirtha* as early as AD 689 (Settar 1990: 16). Pampa may have been an early aquatic folk goddess. Her cult and that of her father, Matanga, reveal an ancient importance of the river, mountains, and caves.

There are several traditions that are joined on the summit of the hill named after Matanga (Pl. 7.1). The hill provides a symbolic protection from enemies. Most importantly, Sugriva was protected from Vali while living on the hill. Matanga's *ashram* had been accidentally defiled by Vali and Matanga's curse prevented Vali from setting foot on the hill, providing a safe heaven for Sugriva. The curse was expanded with time to include protection for all those who seek protection from their enemies. The predator-prey relationship was reversed on its slopes, and hares reportedly chased hounds (Wagoner 1995). According to the creation myth of the city, it was founded by Vidyarana at its present location in order to receive protection from the curse of Matanga. Symbolic radial lines of protection extend outward from the mountain (Fig. 1).

Within the mountain are two sets of caves, which would have provided protection for early inhabitants of the area. Since caves and mountains are such fundamental aspects of Hindu mythology and temple design, their presence reinforces the hill's symbolic significance. The higher cave follows a semicircular route within the mountain starting in an eastern-facing, carved doorway and ending at a distance of 65 metres in a small chamber containing a Shiva *linga* and a statue of Nandi. The larger and lower caves cross the mountain from west to east, starting with a carved image of Ganesh. According to local tradition Matanga and Sugriva once lived in the lower caves.

THE MACROCOSM AND THE NORTH-SOUTH AXIS

The Royal Centre, 1.5 km due south of Matanga hill, is divided into the public and private realms of kingship. Public structures, such as the 100-column audience hall, the great truncated pyramid of the Mahanavami Dibbha, and the elephant stables of the army, are to the east. The palaces of the queens lie primarily to the west (Fritz, 1985, 1989; Malville and Fritz 1993).

The symbolism of separation of space into eastern and western halves by the north-south axis is elaborated by the symmetrical placement of the king's 100-column audience hall (A) and the queen's large palace (P) (Fig. 2). These two structures may be understood to be the two symbolic centres of Vijayanagara power. The axis bisects the connecting line and establishes thereby a "fulcrum of kingship." The centre of the major east facing room of the palace lies 92.8 m to the west of the axis while the centre of the 100-column hall lies 89 m to the east. As viewed from a point midway between these two structures, the *shikhara* of the Virabhadra temple lies only 4 minutes of arc (4') from true north.

The precision with which the north-south line separates the king's audience hall and the queen's palace is impressive and is one of the most accurate documented alignments of the pre-telescopic world. An even greater accuracy is established by the ceremonial gateway (G) in the corridor west of Ramachandra temple (Fig. 2). On the basis of a series of sun sights obtained with a T-2 theodolite during our field seasons of 1991-93, we established that the spire (*shikhara*) of the Virabhadra temple lies 0.8 minutes of arc (0.8') from true north as seen from the centre of the ceremonial gateway.

A second set of measurements was made in 1994 using the Global Positioning System (GPS) with two Garmin GPS 75 receivers operating in a differential mode. A stationary receiver was placed in the compound of the State Archaeology Camp near the Lotus Mahal. More than 8,600 measurements of latitude and longitude were obtained to establish the station at 15°19'11.08" north latitude and 76°28'10.34" east longitude based upon the 1984 World Geodetic System (WGS 84). The latitude and longitude of the *shikhara* of Virabhadra temple on the summit of Matanga hill were measured to be respectively 15°19'53.50" and 76°28'6.12." The centre of the ceremonial gateway in the corridor west of the Ramachandra temple was measured to be 15°19'1.93" and 76°28'6.12". The precision of these differential GPS measurements is approximately .01" in latitude or 30 cm, and at such a level of precision, the gateway and the Virabhadra *shikhara* are exactly north-

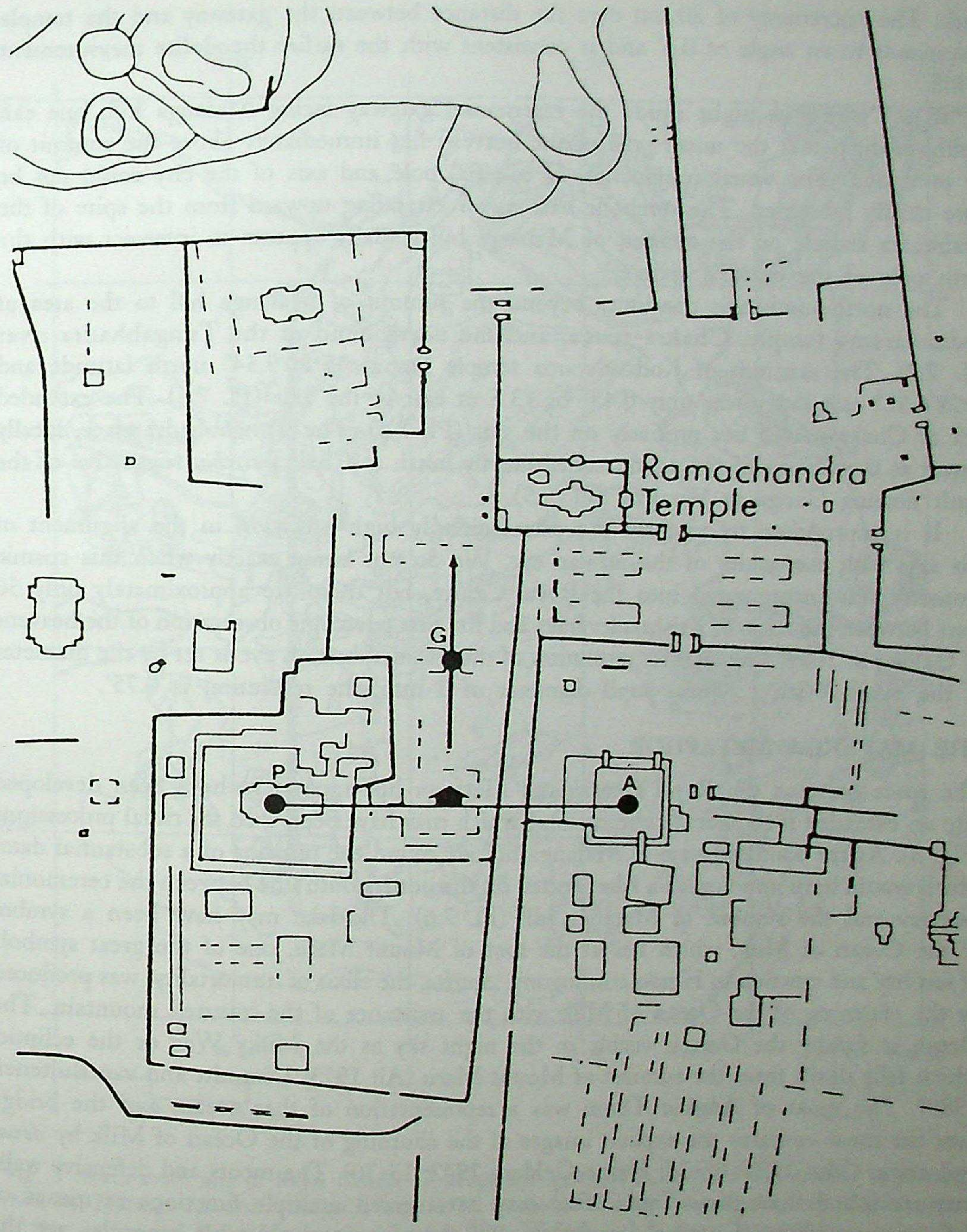

Ramachandra Temple
G
P
A

Fig. 2 The Royal Centre of Vijayanagara: G, ceremonial gateway; A 100 column audience hall; P, queen's palace. (after Fritz, Michell, and Nagaraja Rao 1984)

south. The uncertainty of 30 cm over the distance between the gateway and the temple corresponds to an angle of 0.6' and is consistent with the earlier theodolite measurement of 0.8'.

If one stands at night inside the ceremonial gateway facing Matanga hill, one can readily confirm that the north pole of the heavens lies immediately above the summit of the mountain. The visual conjunction of celestial pole and axis of the city could not be more clearly presented. The symbolic *axis mundi* extending upward from the spire of the Virabhadra temple on the summit of Matanga hill actually appears to intersect with the north pole of the celestial sphere.

The north-south axis continues beyond the summit of Matanga hill to the area of Kodandarama temple, Chakra-*tirtha*, and the north bend of the Tungabhadra river (Pl. 7.2). The sanctum of Kodandarama temple lies at 15°20'9.54" north latitude and 76°28'6.57" east longitude, only 0.45" or 13.5 m east of the axis (Pl. 7.3). The extended area of Chakra-*tirtha* lies precisely on the axis (Pl. 7.4). The Tungabhadra river, locally known as the Ganga of the south, turns directly north at Chakra-*tirtha*, suggestive of the north flowing Ganga at Varanasi (Pl. 7.5).

It is appropriate to compare the extraordinarily high precision in the alignment of this axis with the acuity of the human eye. We do not know exactly when this cosmic geometry was incorporated into the Royal Centre, but there are approximately only 50 years between the reign of Krishnadevaraya and the first telescopic observation of the heavens by Galileo in 1609. The angular resolution of the unaided human eye is set by the diameter of the pupil. With a typical pupil diameter of 3 mm, the resolution is 0.75'.

THE MATANGA METAPHOR

The space between the Royal Centre and Matanga hill appears to have been developed into an extended metaphor for the cosmos, which may have been used for ritual processions (Fig. 3). At the southern base of Matanga hill are found the remains of a substantial dam, which would have impounded a lake located on the north-south line between the ceremonial gateway and the summit of Matanga hill (Pl. 7.6). The lake may have been a symbol of the Ocean of Milk, which lies at the foot of Mount Meru, one of the great symbols of fertility and creation in Hindu cosmogony. *Amrita*, the elixir of immortality, was produced by the churning of the Ocean of Milk with the assistance of the inverted mountain. The Ocean is fed by the Ganga, visible in the night sky as the Milky Way or the ecliptic, which falls down from the summit of Mount Meru (Ali 1973; Dimmitt and van Buitenen 1983). The moat of Angkor Thom was a representation of that ocean, and the bridge over the moat contains the explicit images of the churning of the Ocean of Milk by *devas* and *asuras* (Mus 1837: 65-75; Heine-Geldern 1942: 15-30). The moats and defensive walls that are found throughout India often may have served multiple functions as means of defense, containers of symbolic meaning, and sites for ritual. Notable examples are the moats and walls of Madurai and Warangal (Michell 1992).

The kings of Kandy built an artificial lake named Kiri Muhuda, Ocean of Milk, in

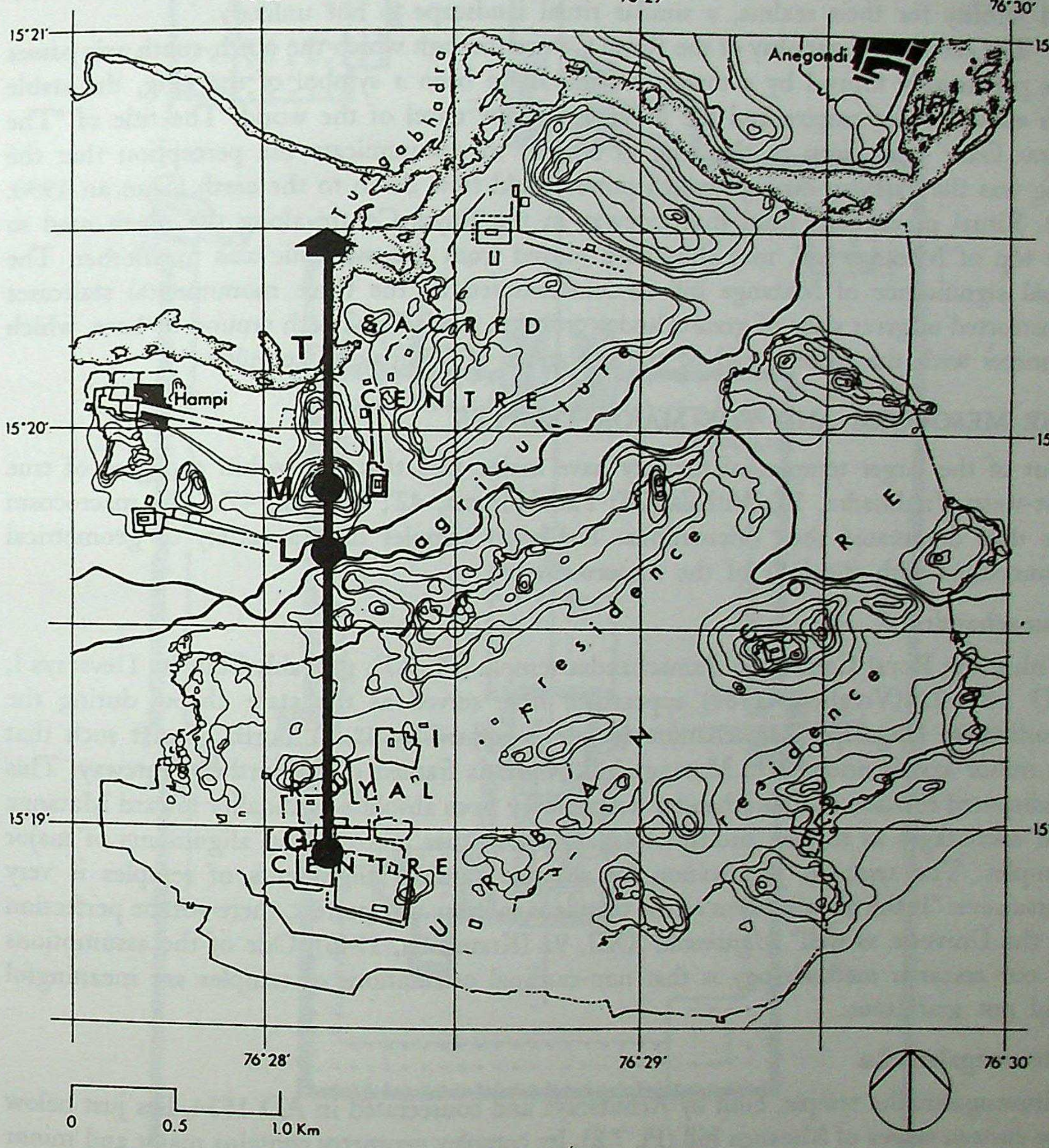

76°28′
76°29′
76°30′
15°21′
15°20′
15°19′
Tungabhadra
Anegondi
Hampi
T
SACRED
CENTRE
M
L
agriculture
residence
residence
URBAN CORE
ROYAL
CENTRE
G
0
0.5
1.0 Km

Fig. 3 North-south axis of Royal Centre: G, ceremonial gateway; L, artificial lake at base of Matanga hill; M, Matanga hill and Virabhadra temple; T, northward flowing Tungabhadra river, Chakra-*tirtha* and Kodandarama temple. (after Fritz, Michell, and Nagaraja Rao 1984)

an apparent effort to establish their own cosmic connections (Duncan 1990). Since the kings of Vijayanagara were interested in identifying themselves as the sources of stability and fertility for their realms, a similar ritual landscape is not unlikely.

The ceremonial gateway of the Royal Centre through which the north-south axis passes was presumably topped by a tower and may have been a symbol of the king, the stable *axis mundi* of the empire and the mountain at the navel of the world. The title of "The Great Gate" was given to the king of Kandy, to communicate the perception that the king was the gateway through which power could flow down to the earth (Duncan 1990: 21). Ritual processions from that gateway in the Royal Centre along the north road to the top of Matanga hill, may thus have moved from one symbolic axis to another. The ritual significance of Matanga hill is demonstrated by the three monumental staircases constructed of great slabs of granite and a probable *pradakshina* path around its base, which connects with the eastern end of the car street of Virupaksha temple.

THE MESOCOSM AND THE MAJOR TEMPLES

Four of the larger temples of the city have major axes that are within a degree of true east-west: Virabhadra, 13'; Vithala, 20'; Pattabhirama, 42'; Krishna, 47'. The macrocosm has thus dominated their orientations. The other temples have a variety of geometrical connections with the hills of the mesocosm.

Ramachandra

Within the Royal Centre the Ramachandra temple (Pl. 7.7), probably built by Devaraya I, AD 1406-22 (Verghese, 1989) appears to have served as the state chapel during the Vaishnavite kingships. Ramachandra temple is rotated by 1° 30' north of east such that its minor axis is oriented to Matanga hill, which is framed in its northern gateway. This undisputed rotation of Ramachandra temple away from absolute cardinality toward Matanga hill encourages us to seek similar explanation for other non-cardinal alignments of major temples. The symbolic justification for accurate cardinal alignments of temples is very persuasive: "If the measurement of the temple is in every way perfect, there will be perfection in the Universe as well" *Mayamata*, XXII, 92 (Kramrisch, 1946). One of the assumptions of our research methodology is that non-cardinal orientations of temples are meaningful and not gratuitous.

Tiruvengalanatha

Tiruvengalanatha temple, built by Achutaraya and consecrated in AD 1534, lies just below the eastern slopes of Matanga hill (Pl. 7.8). Its complex geometry contains major and minor axes that are skewed by 3°10' away from perpendicular. No other major temple of the city shows such an anomaly. It seems as if the tension between local and cosmic in the minds of the architects ruptured the symmetry of the temple plan. The minor axis is oriented to true east-west, but its major axis is rotated by 3°10' to the west of north (Fig. 4 & Pl. 7.9). That axis is parallel to the line connecting the summit of Matanga hill with the birthplace of Hanuman on Anjenadri hill, which has an azimuth of 3°6'. A compromise

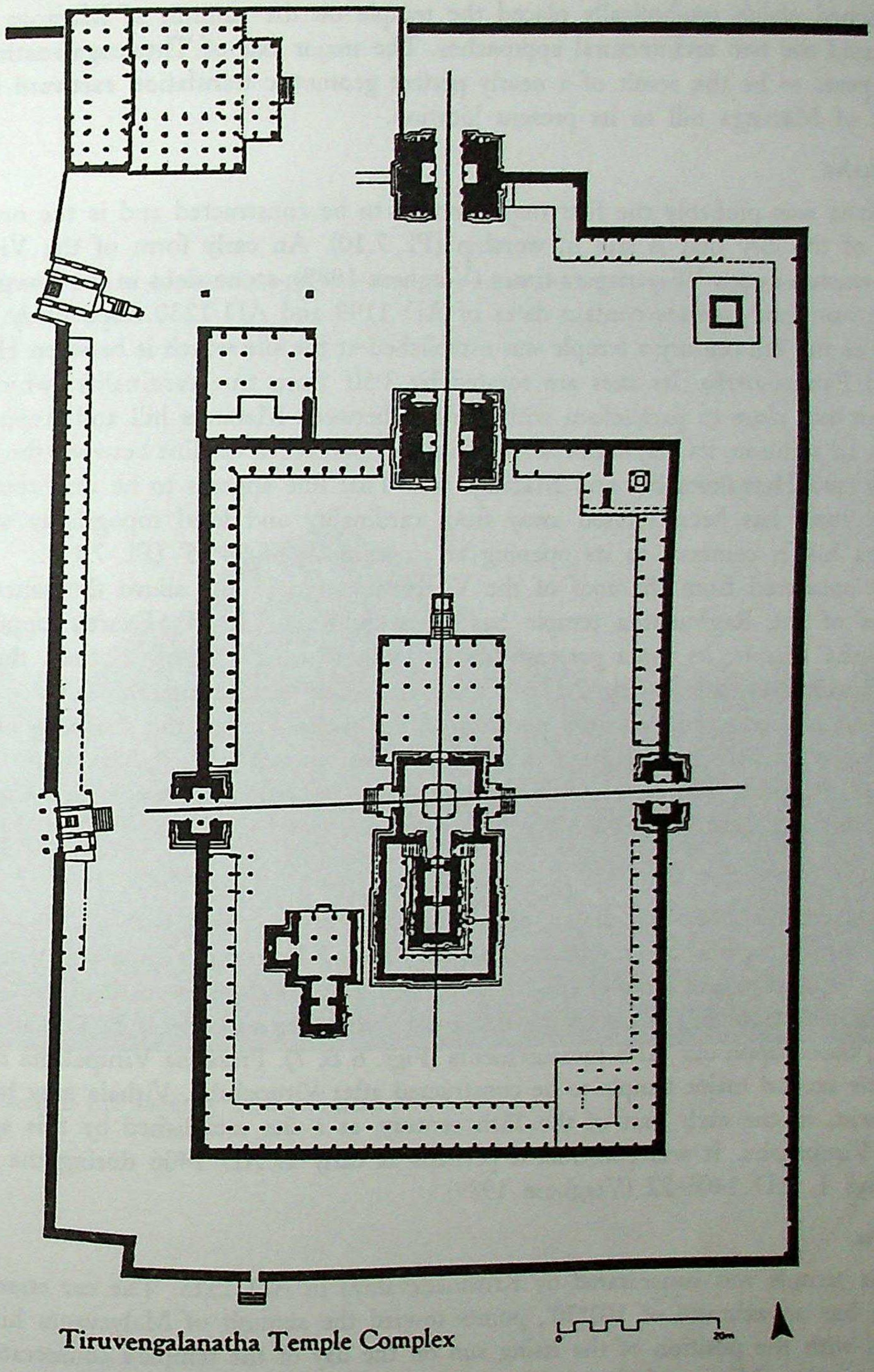

Tiruvengalanatha Temple Complex
0
20m

Fig. 4 Tiruvengalanatha temple. Note the departure from othrogonality of its axes. (after Michell 1990)

was reached which symbolically placed the temple on the summit of Matanga hill and synthesized the two architectural approaches. The major axis of Tiruvengalanatha temple thus appears to be the result of a nearly perfect geometric translation eastward from the summit of Matanga hill to its present location.

Virupaksha

Virupaksha was probably the first major temple to be constructed and is the only major temple of the city that is still in worship (Pl. 7.10). An early form of the Virupaksha temple existed in pre-Vijayanagara times (Verghese 1989); stone slabs in the Durga temple and the northern *goporum* contain dates of AD 1199 and AD 1230 respectively. Perhaps as early as the 7th century a temple was established at the site which is between Hemakuta hill and Pampa-*tirtha*. Its axes are rotated by 3°50' from true cardinality, which brings its minor axis close to parallelism with the line between Matanga hill and Anjenadri hill (Fig. 5). In addition, its major axis is approximately parallel to the line between the southern gateway into Hemakuta hill and Matanga hill. That line appears to be important as the gateway itself has been rotated away from cardinality and local topography such that Matanga hill is centered in its opening at an azimuth of 94°25' (Pl. 7.11).

As measured from the roof of the Virabhadra temple just above the sanctum, the *goporum* of the Raghunatha temple has an azimuth of 110°35'. Exactly opposite lies Virupaksha temple; its inner *goporum* has an azimuth of 291°, only 1' from the line to the Raghunatha temple (Pl. 7.11). Today, the line connecting these three temples approximately intersects with the position of the rising sun on the morning of *makara samkranti* when, on January 14, the sun enters the constellation of Makaram. The first gleam of the rising sun occurs within a solar diametre of the *goporum* of the Raghunatha temple as seen from Matanga hill.

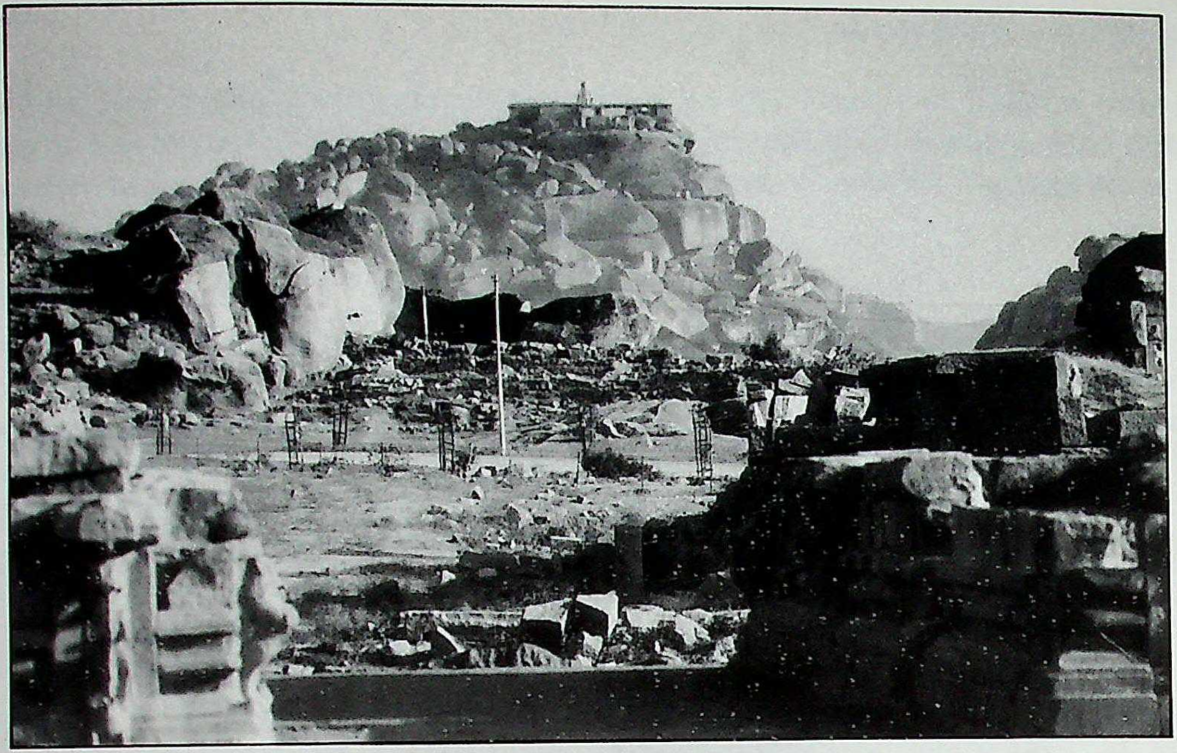
Vithala

It appears that a circle was drawn with Virupaksha at its centre, with a radius of 2,057 metres, which established the locations of Vithala and Prasanna Virupaksha temples (the so-called Underground temple) (Pls. 7.13 & 14). The distances from the *garbha griha* of Virupaksha to those of Prasanna Virupaksha and Vithala are respectively 2,057.8 and 2,057.0 metres, based upon our GPS measurements (Figs. 6 & 7). Prasanna Virupaksha may have been the second major temple to be constructed after Virupaksha. Vithala may have been built next, in the early part of the 15th century, at a site established by this symmetry about Virupaksha. It was constructed perhaps as early as AD 1406 during the reign of Devaraya I, AD 1406-22 (Verghese 1989).

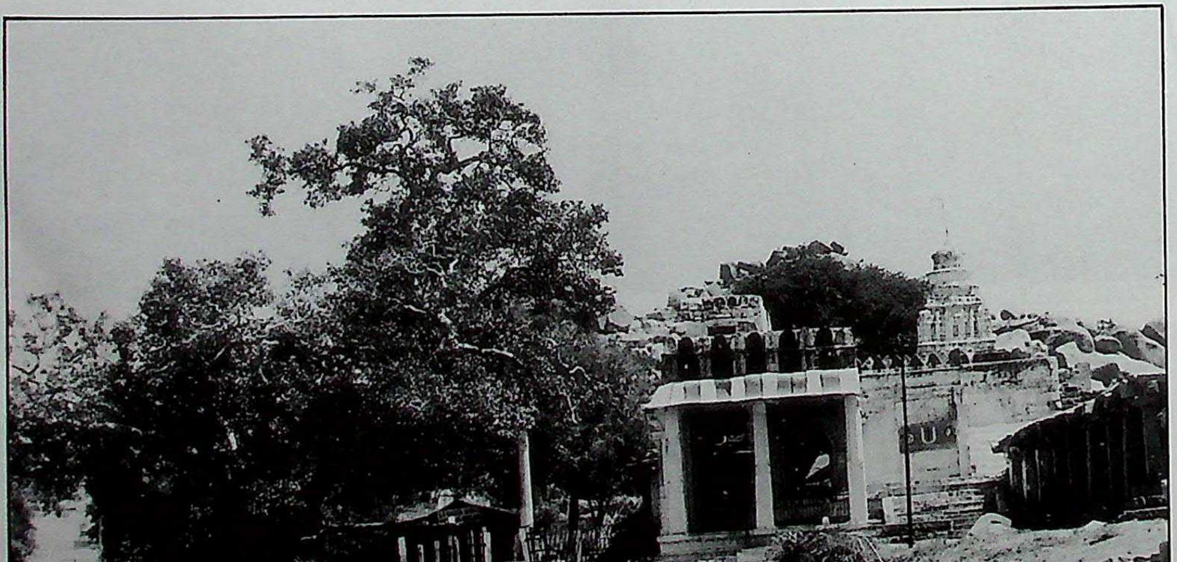
Krishna

Krishna temple was consecrated by Krishnadevaraya in AD 1515. The car street of the temple has an azimuth of 101°30', points toward the summit of Malyavanta hill and is aligned with the position of the rising sun on the day of the temple's consecration. The line connecting Matanga hill and the southern gateway of Hemakuta hill, which is parallel

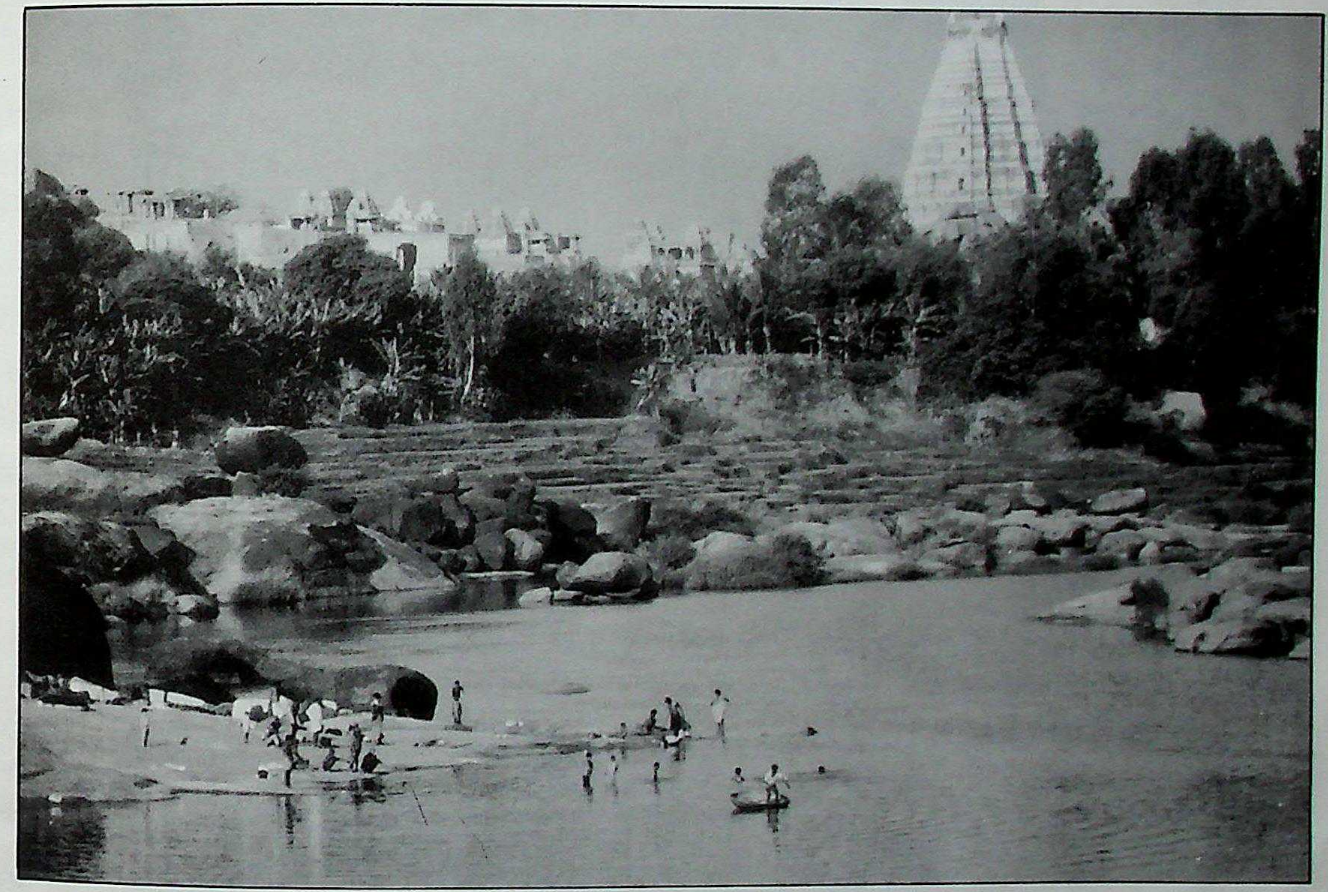
Pl. 7.1 Matanga hill looking west at sunset



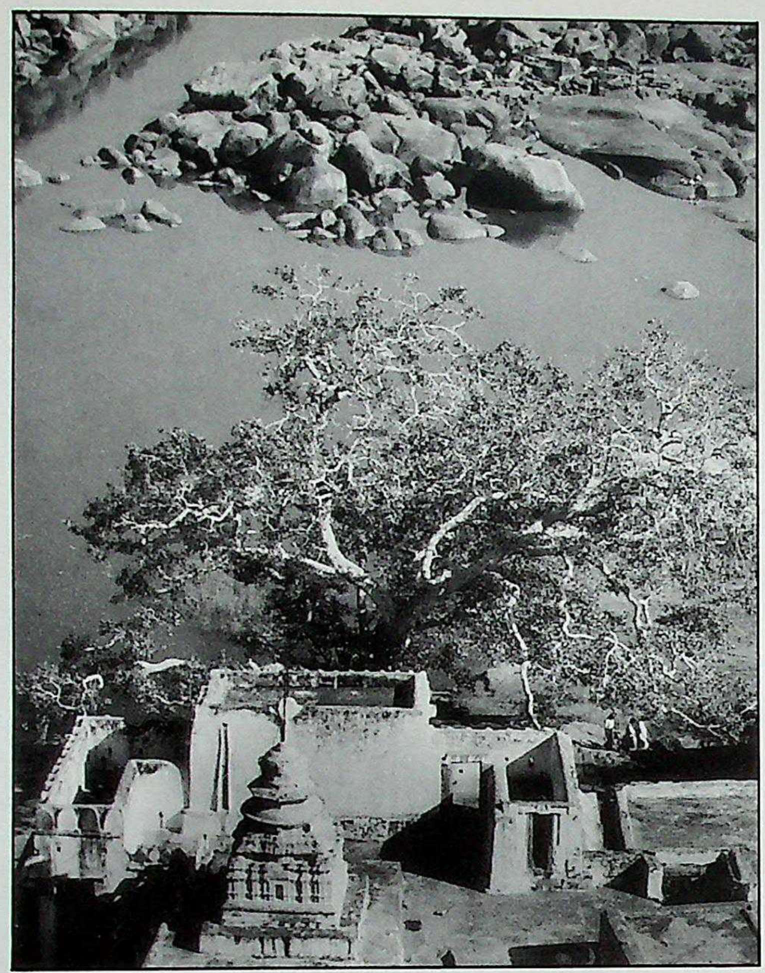
Pl. 7.2 Matanga hill looking north. Ceremonial gateway is in foreground



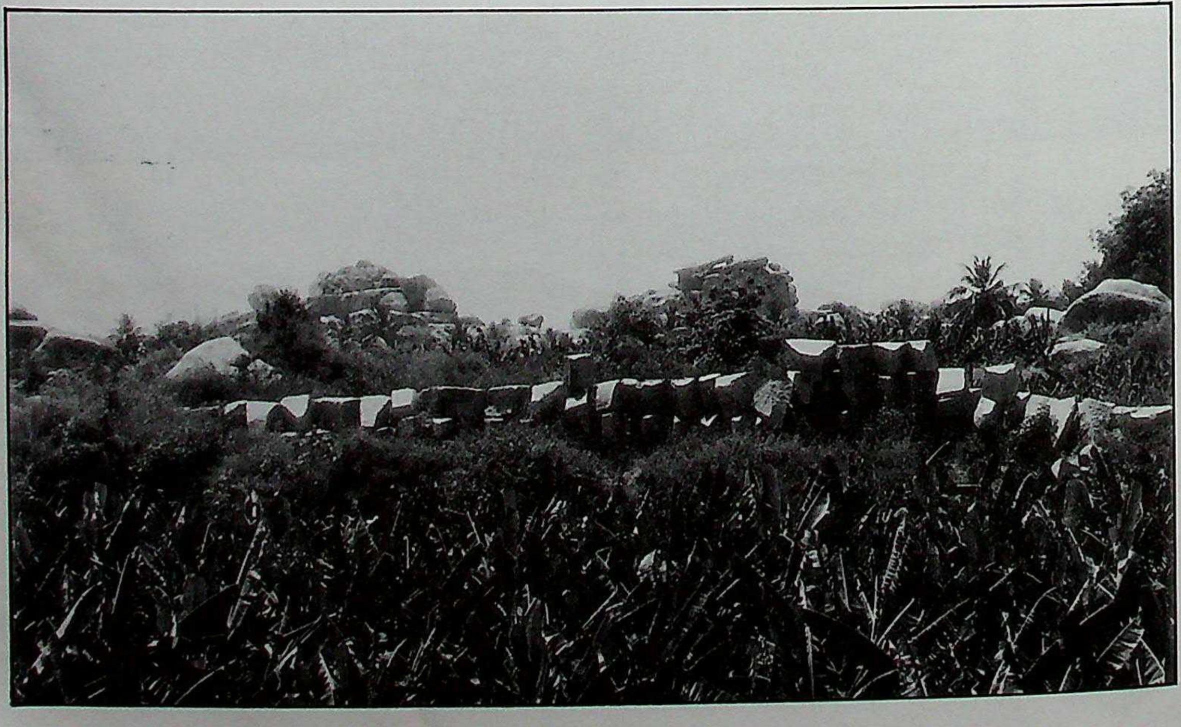
Pl. 7.3 Kodandarama temple viewed from Chakra-*tirtha*



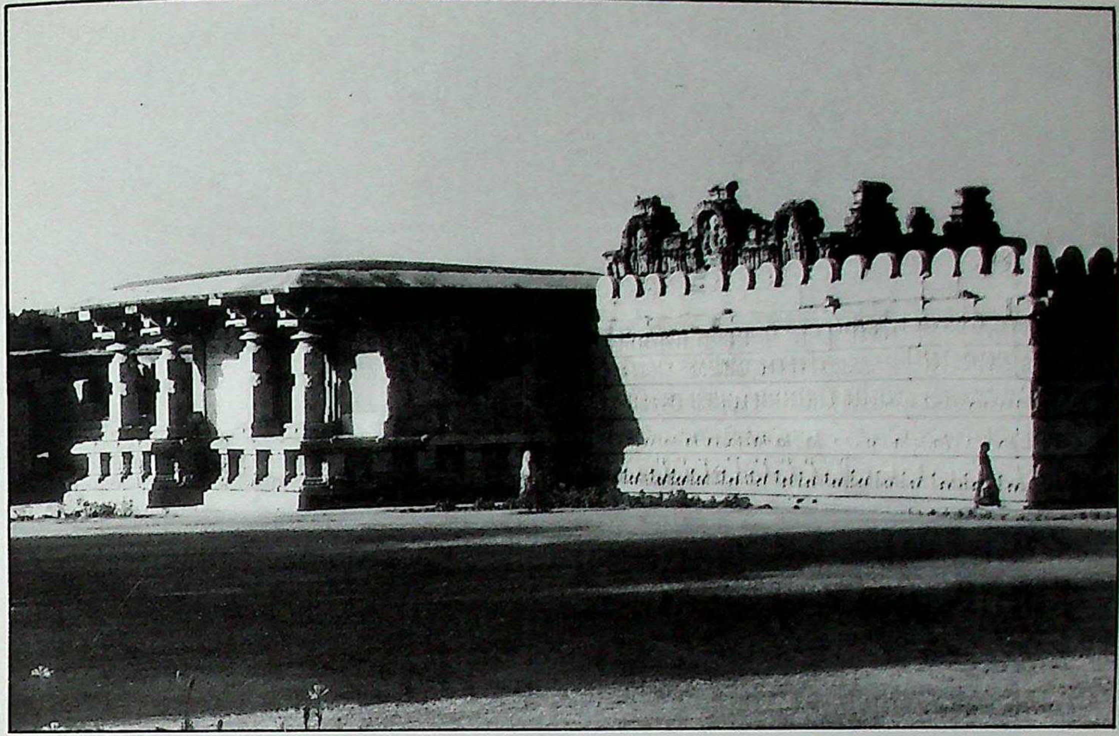
Pl. 7.4 Chakra-*tirtha*. The eastern *goporum* of Virupaksha temple is in the background on the right; the temples of Hemakuta hill are on the left.



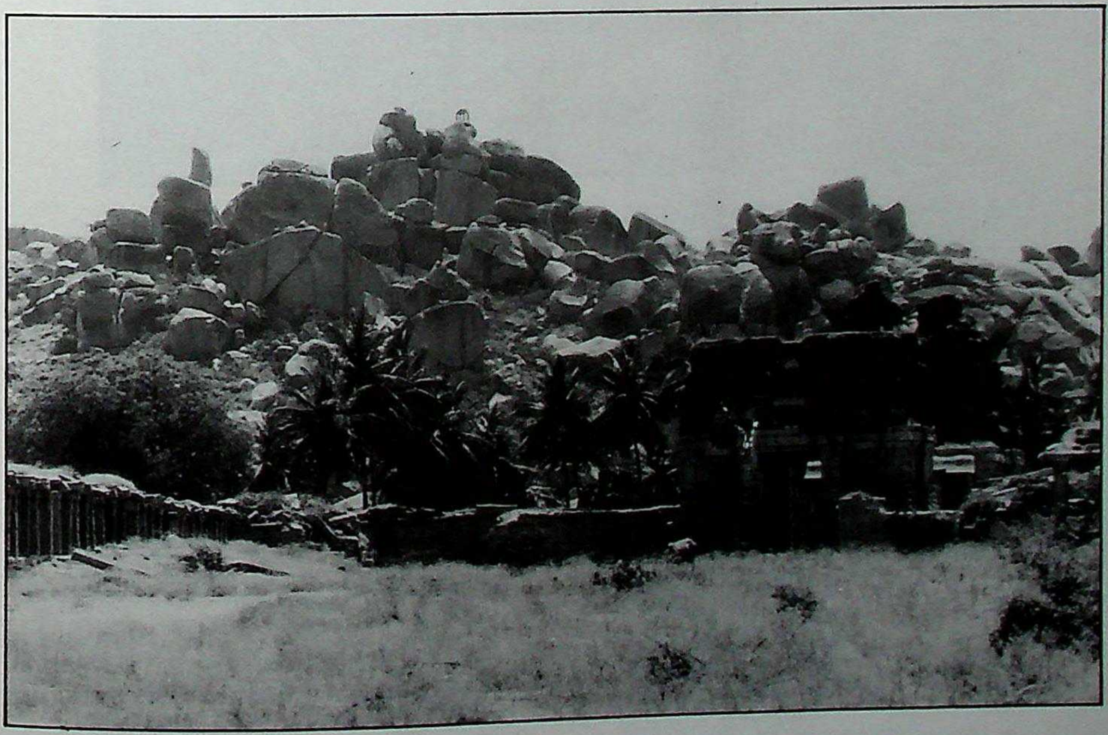
Pl. 7.5 Tungabhadra river looking north from above Kodaṅdarama temple



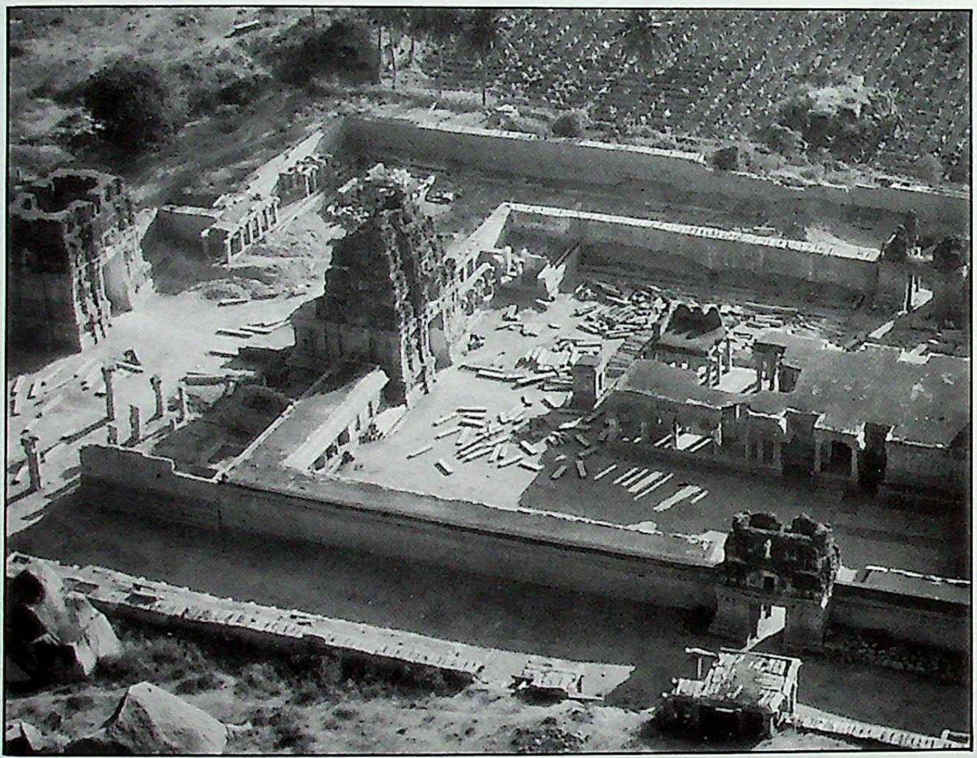
Pl. 7.6 Dam at the southern foot of Matanga hill



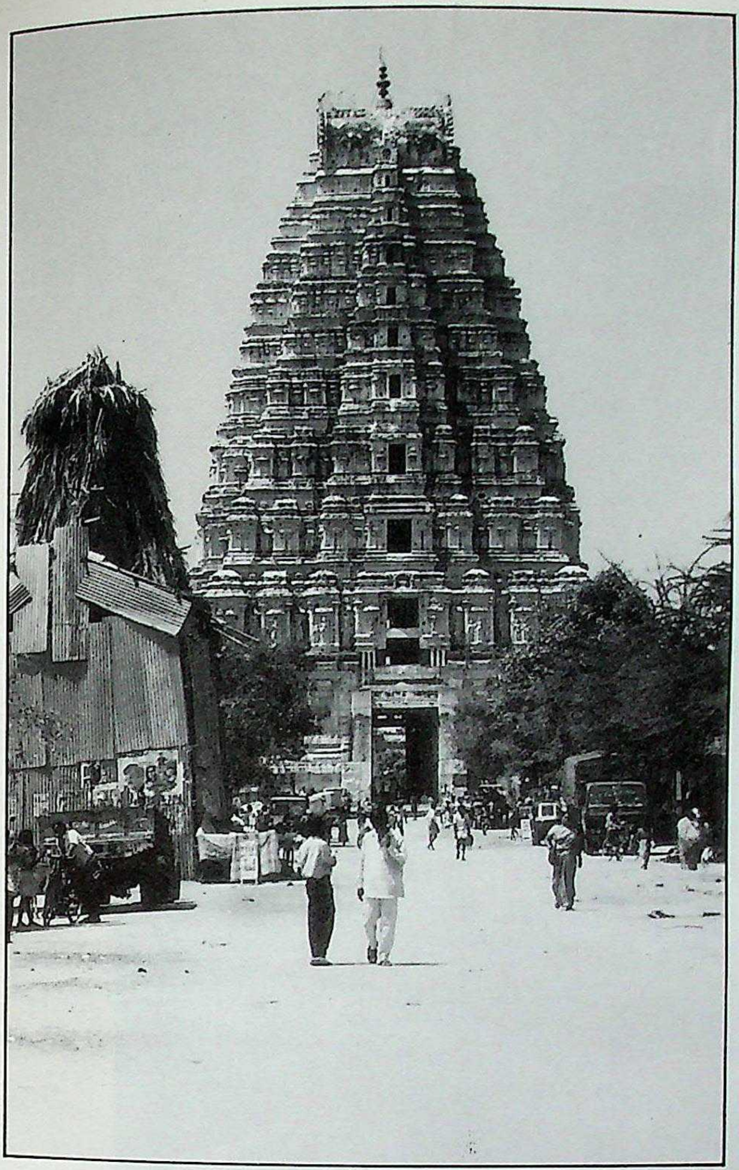
Pl. 7.7 Ramachandra temple



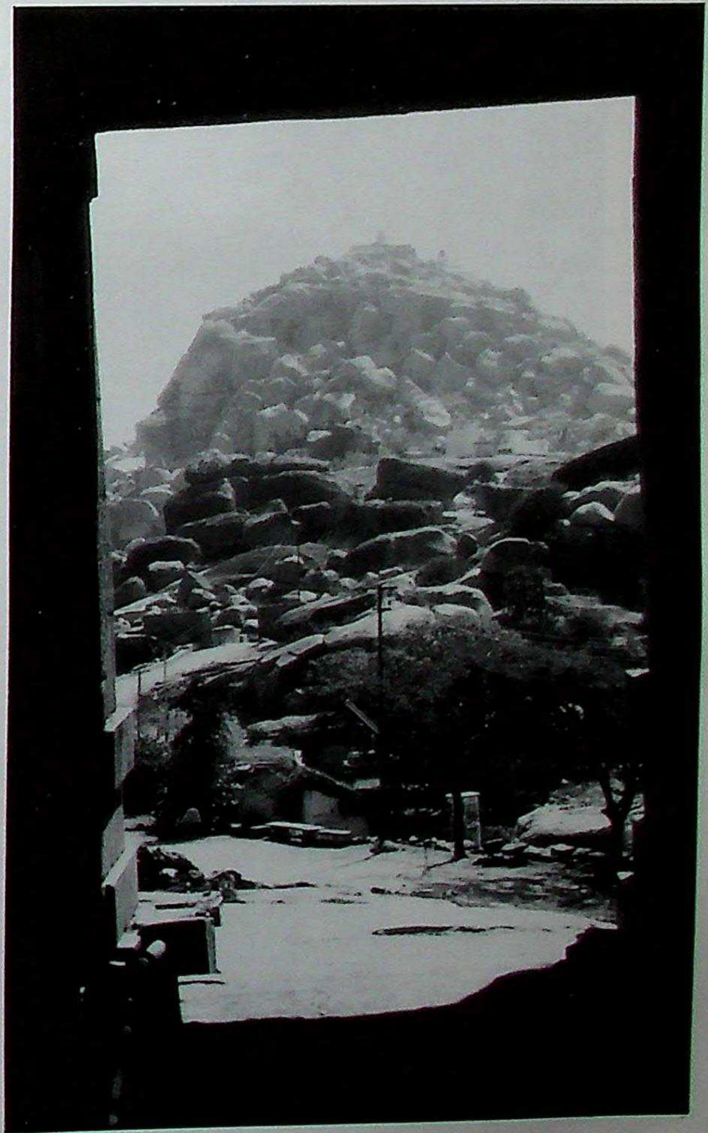
Pl. 7.8 Tiruvengalanatha temple viewed from its car street



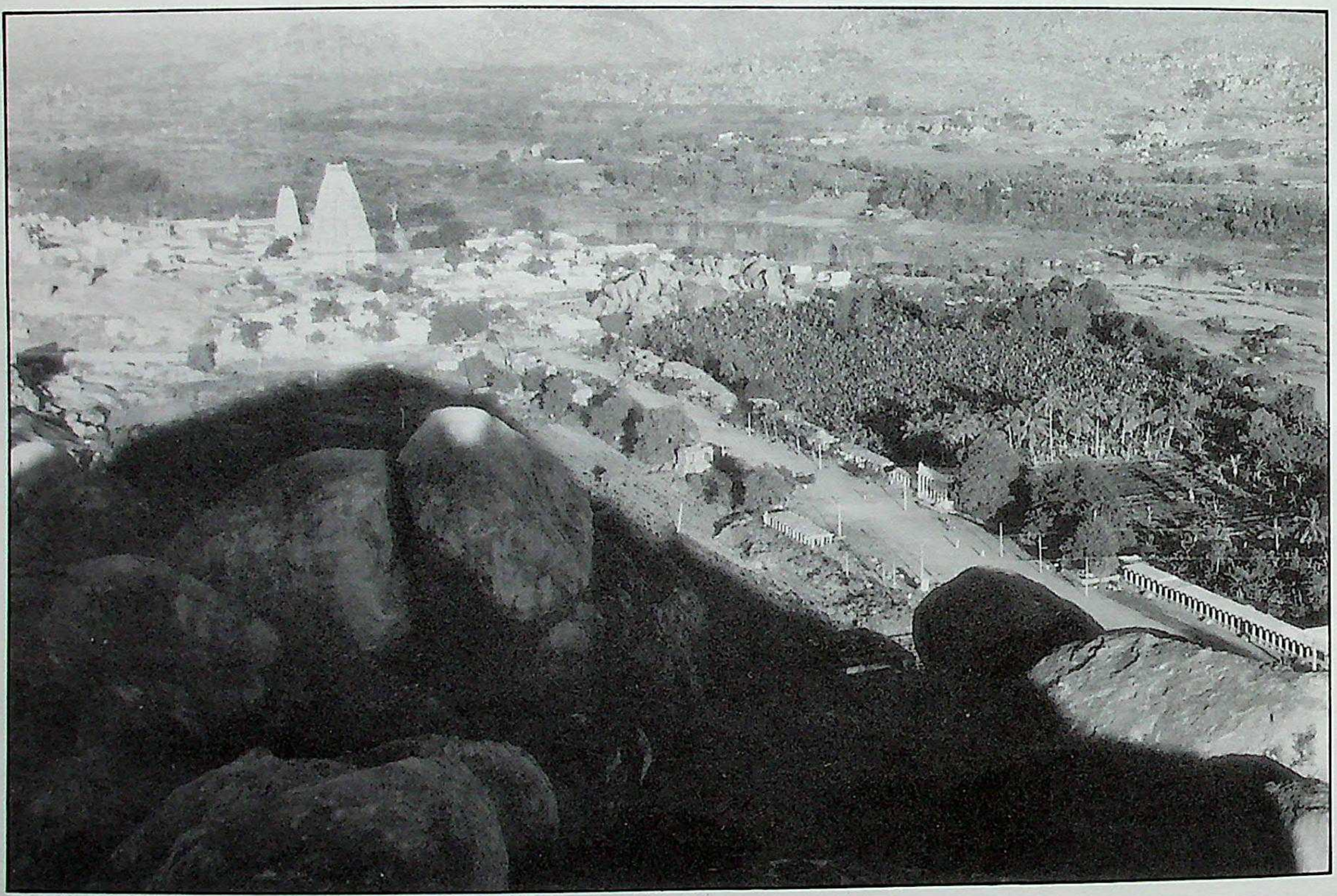
Pl. 7.9 Tiruvengalanatha temple viewed from summit of Matanga hill



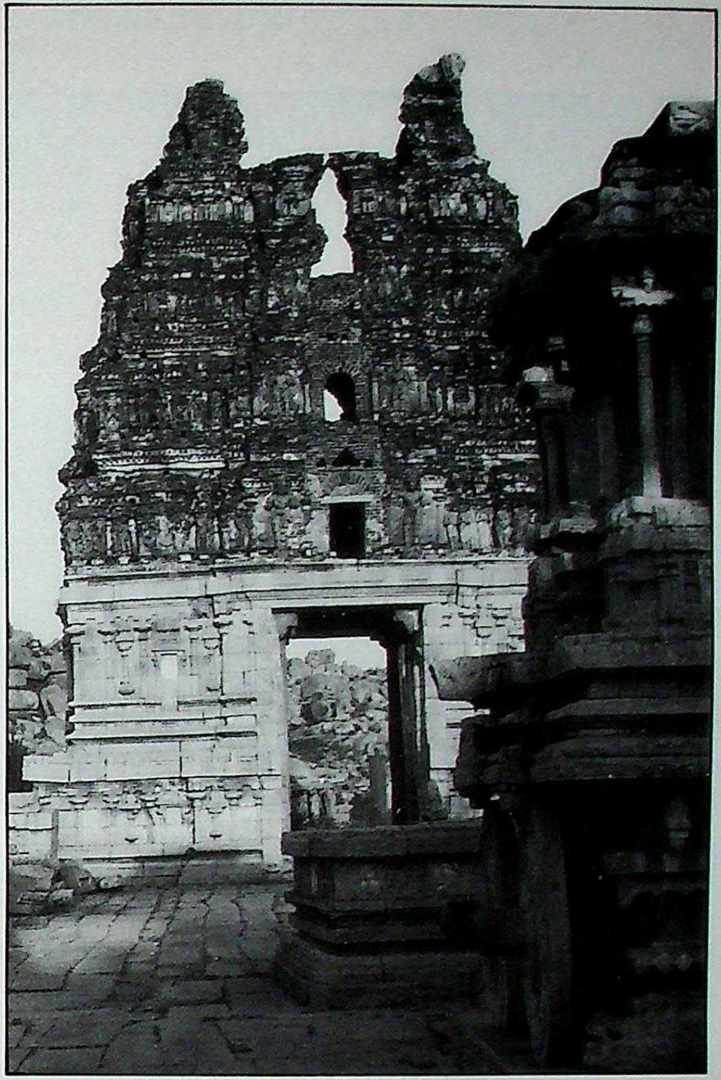
Pl. 7.10 Eastern *goporum* of Virupaksha temple viewed from its car street



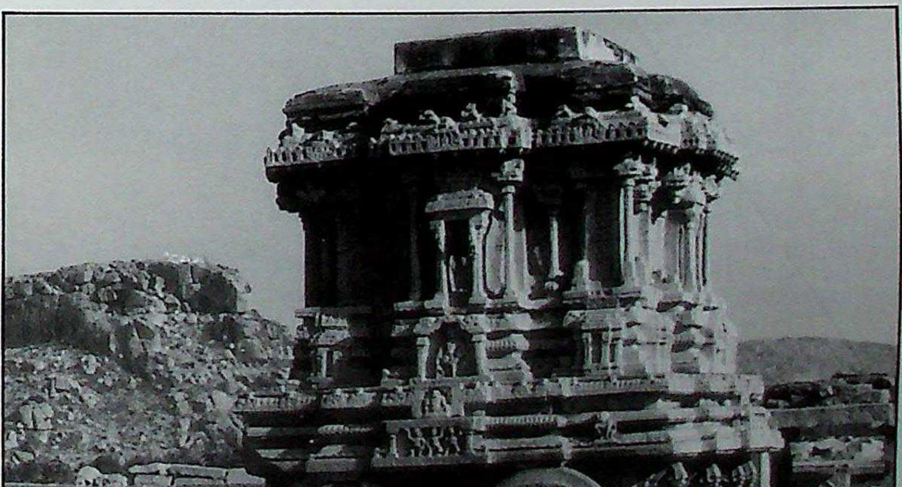
Pl. 7.11 Matanga hill viewed from the northern doorway of Ramachandra temple



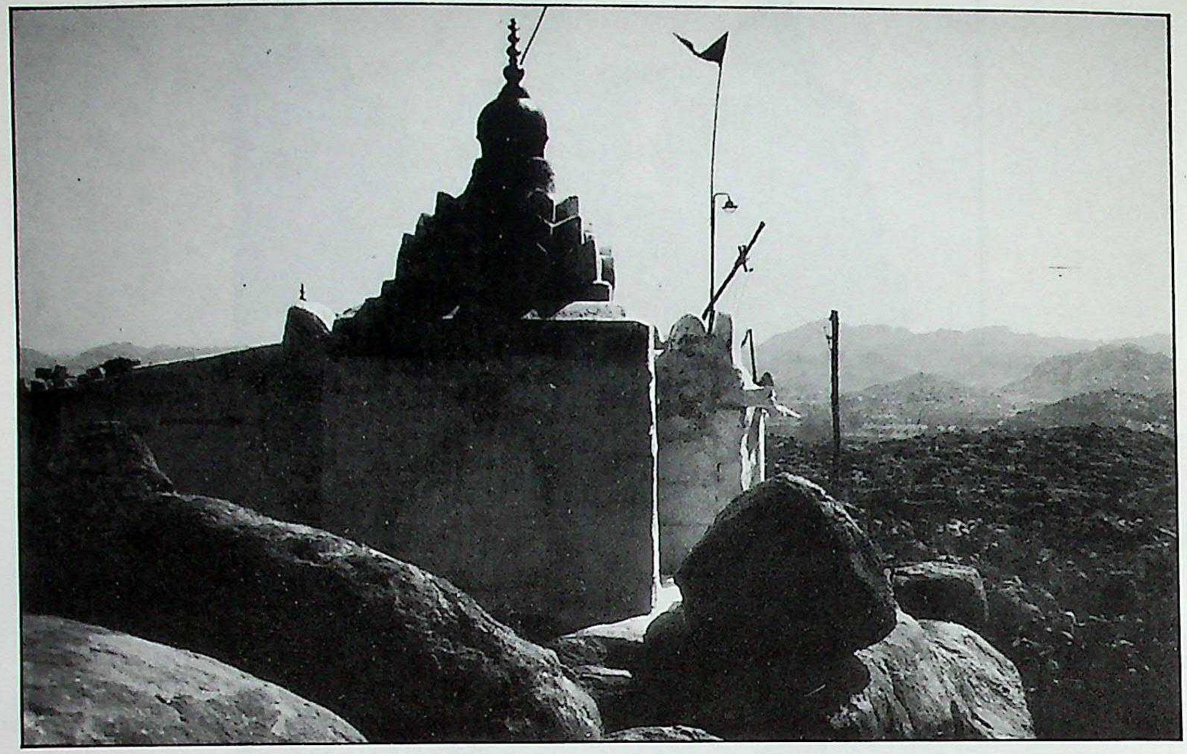
Pl. 7.12 Virupaksha temple viewed from the summit of Matanga hill on the morning of *makara samkranti*



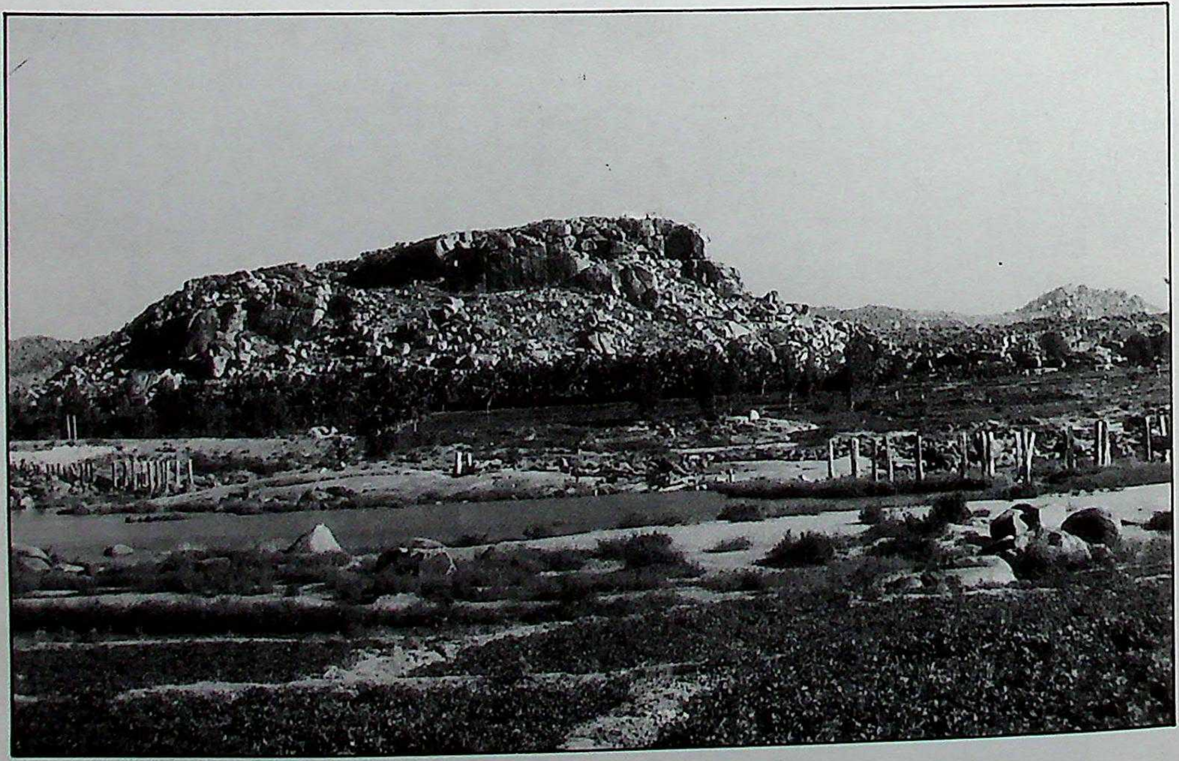
Pl. 7.13 Eastern *goporum* of Vithala temple



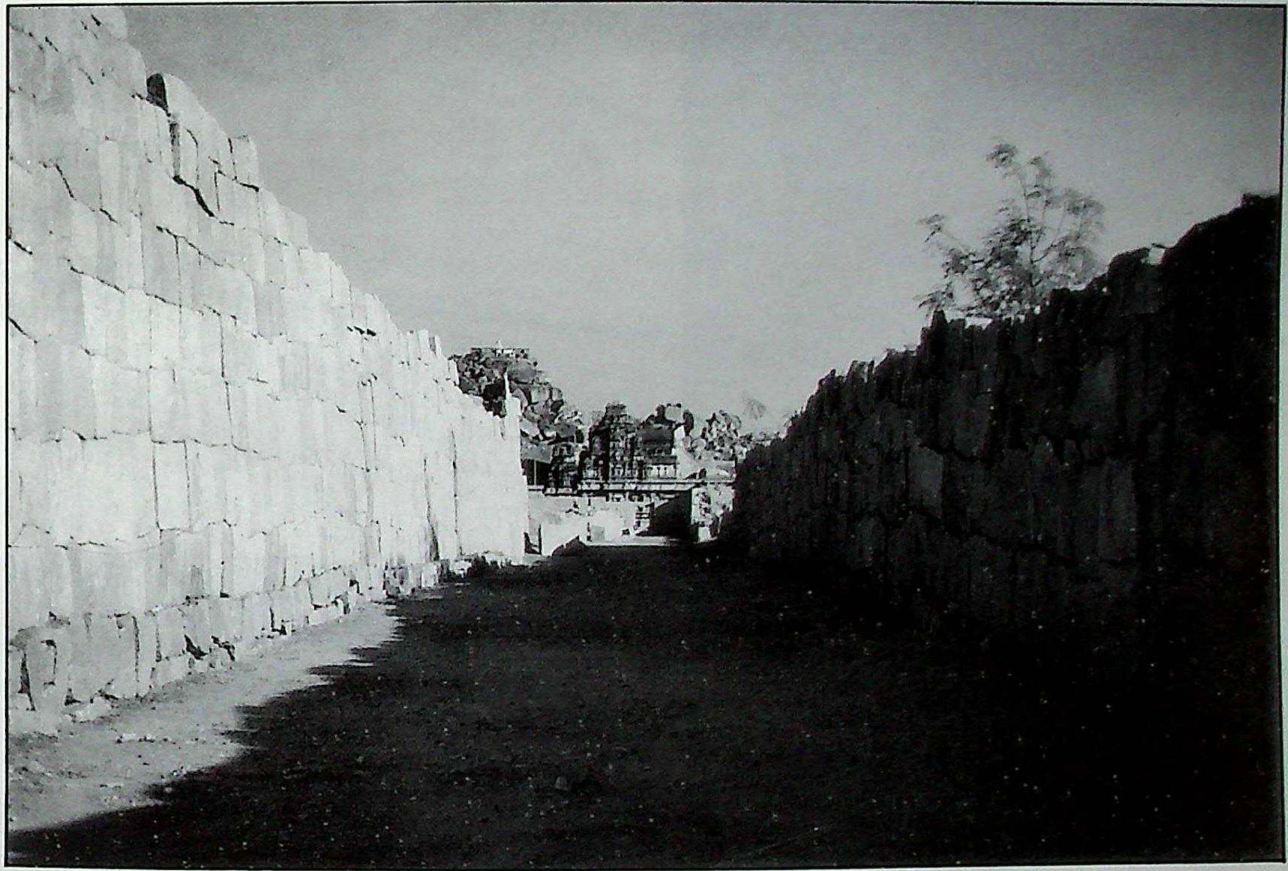
Pl. 7.14 Stone chariot in Vithala temple. The Hanuman shrine on Anjenadri hill is in the background



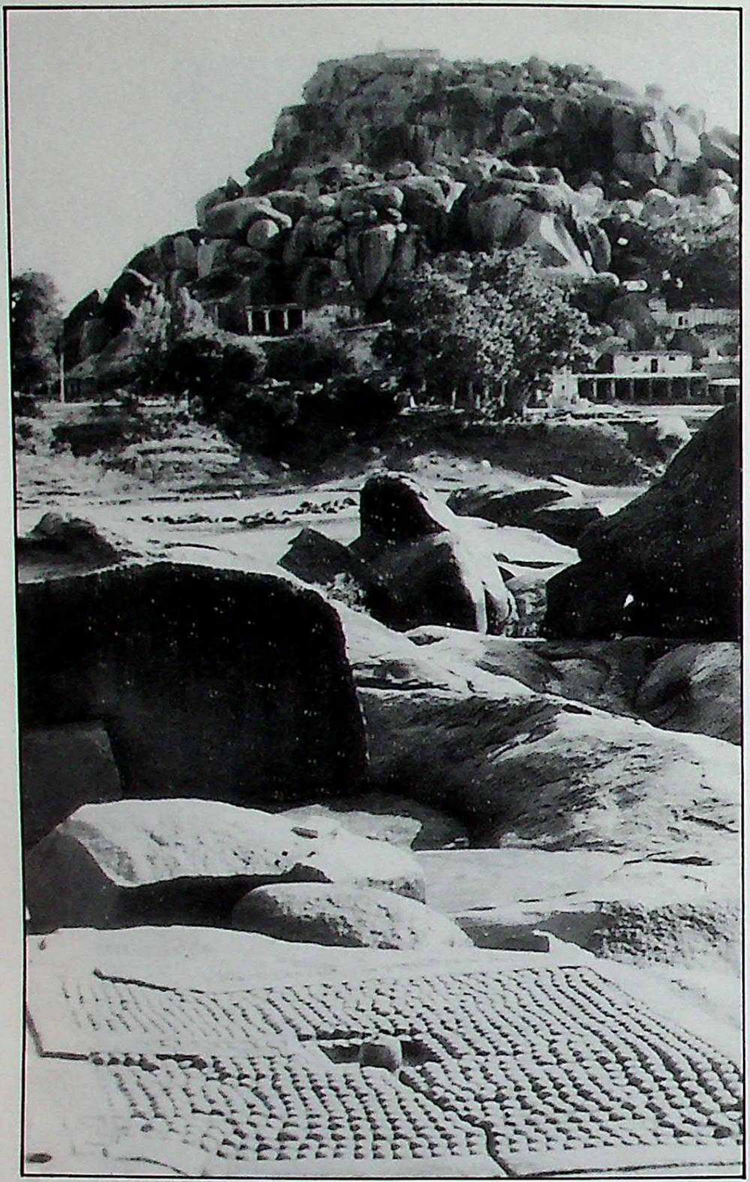
Pl. 7.15 Hanuman shrine on Anjenadri hill



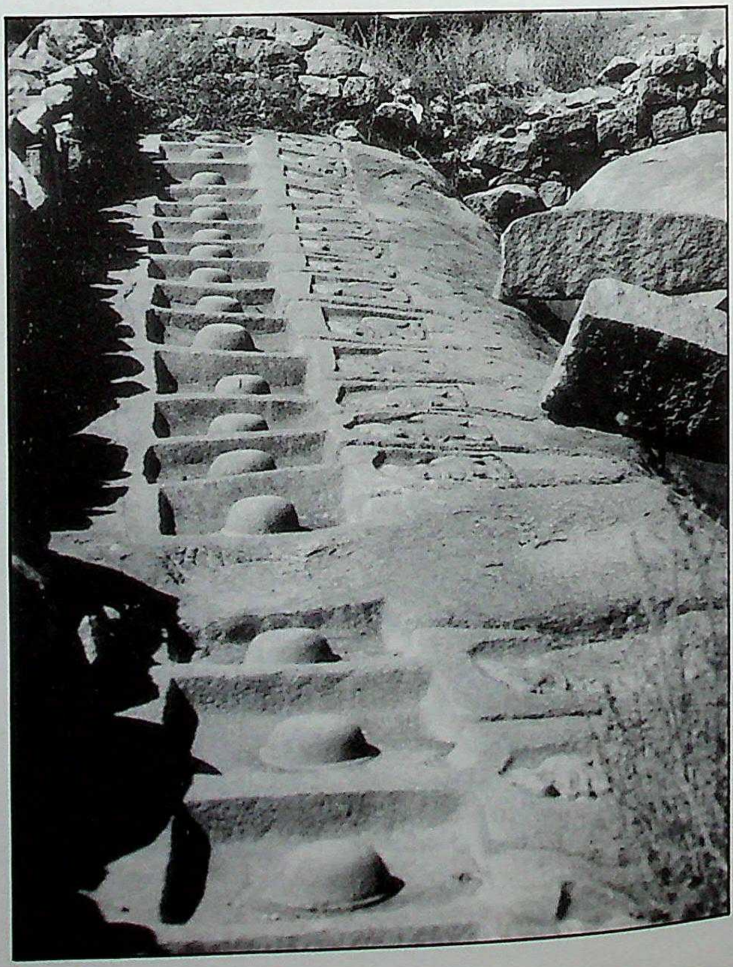
Pl. 7.16 Anjenadri hill



Pl. 7.17 Western section of King's pathway looking north to Ramachandra temple. Virabhadra temple is in the background on the left



Pl. 7.18 Matanga hill. Kotilinga-*tirtha* is in the foreground



Pl. 7.19 Laksmana *bana* on summit of Malyavanta hill

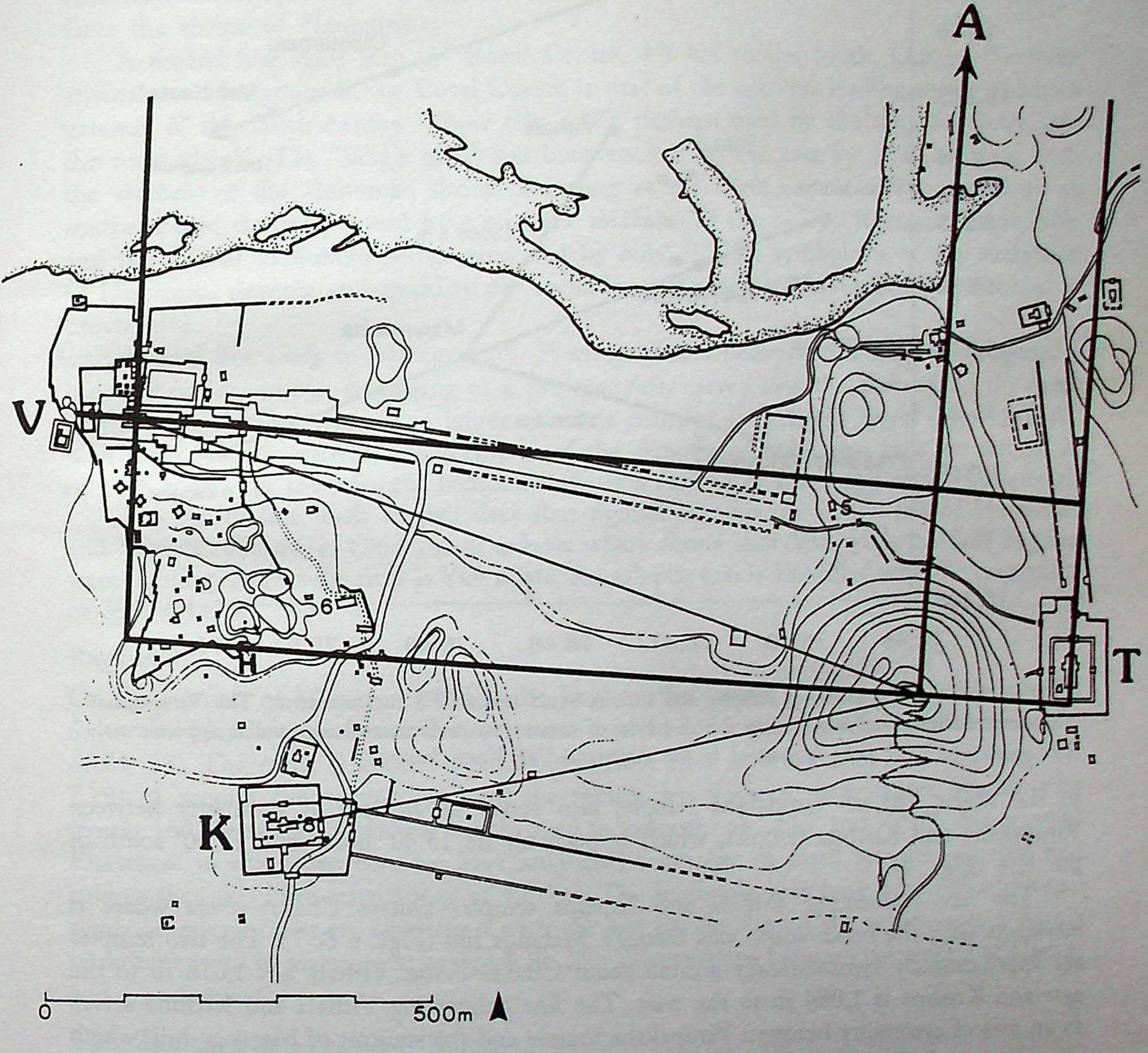


Fig. 5 Sacred Cente of Vijayanagara: A, line toward Anjenadri hill; T, Tiruvengalanatha temple; H, southern gateway of Hemakuta hill; K, Krishna temple; V, Virupaksha temple.

Note : (a) the parallelism of the major axis of Virupaksha and the line connecting Matanga hill to the southern gateway, H; (b) the parallelism of the major axis of Tiruvengalanatha temple and the line connecting Matanga hill to Anjenadri hill; (c) the symmetry of Virupaksha and Krishna temples about the line connecting Matanga hill to the souther gateway, H (after Fritz and Michell 1991)

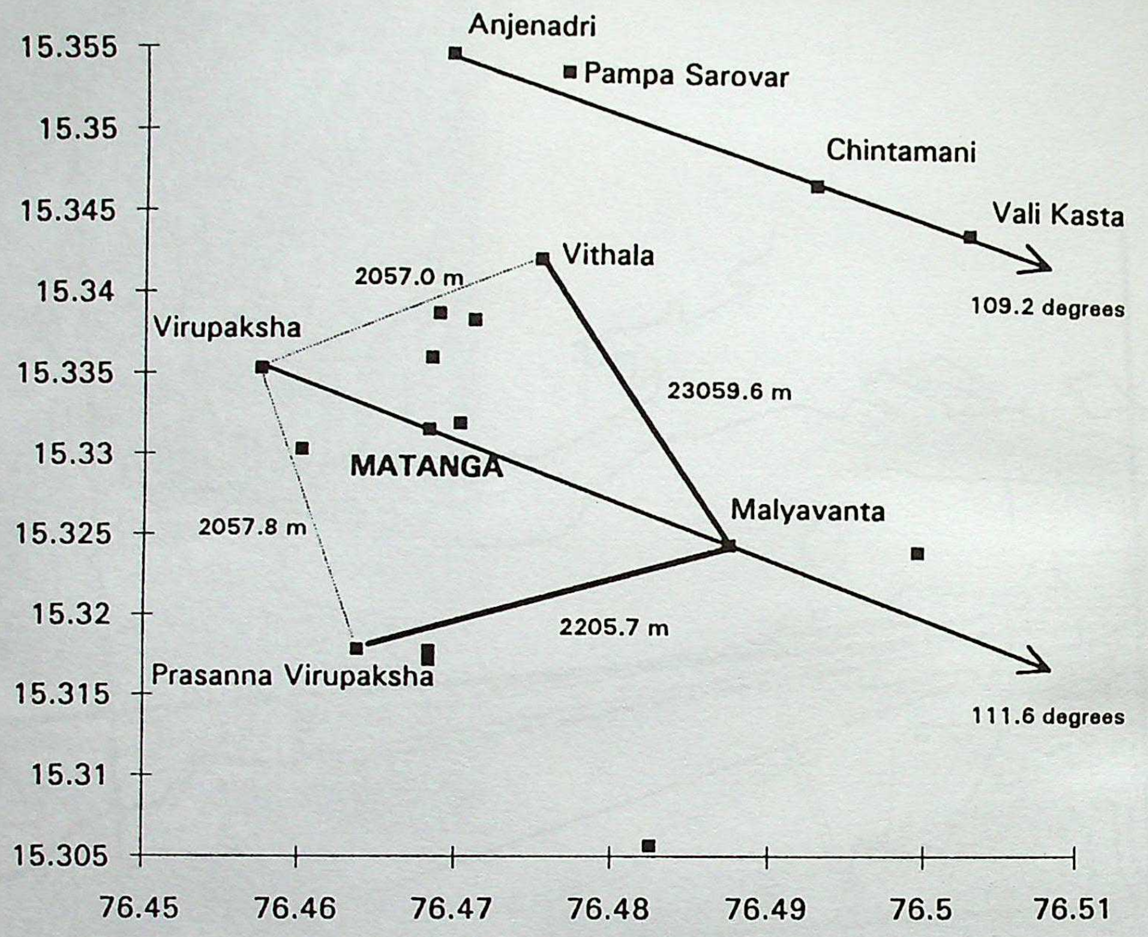


Fig. 6 Spatial organization of temples and shrines based upon GPS measurements. The Virupaksha-Matanga-Malyavanta "arrow" is in the direction of sunrise on *makara samkranti* and is approximately parallel to the Anjenadri-Vali Kasta "arrow"

to the major axis of Virupaksha temple, also serves as an axis of symmetry between Virupaksha and Krishna temples, which respectively lie 15°40' north and 15°30' south of the line (Fig. 4).

The line connecting Vithala and Krishna temples crosses Chakra-*tirtha* where it intersects with the north-south axis through Matanga hill (Figs. 6 & 7). The two temples are approximately symmetrically located about Chakra-*tirtha*: Vithala lies 1,016 m to the east and Krishna is 1,084 m to the west. The line connecting Vithala and Krishna serves as an axis of symmetry between Virupaksha temple and the summit of Matanga hill, which are respectively 17°50' north and 17°20' south of the line.

Anjenadri

On the summit of Anjenadri, a small shrine opening to the east contains a rock carving of Hanuman (Pl. 7.15). Although it is a small structure, its prominent location, brilliant white in the sunlight, makes it an obvious feature throughout much of the city (Pl. 7.16). There are a number of direct sight-lines radiating outward from the shrine.

First, there is a line toward Chakra-*tirtha*. The perpendicular to the shrine's east-west axis crosses the Tungabhadra river at Chakra-*tirtha*. Next to Chakra-*tirtha*, the north facing Kodandarama temple has been rotated clockwise by 4°45' from true north such that it faces the shrine of Hanuman.

A second line leads into the Royal Centre, 4.8 km to the south. One of the more anomalous orientations in the Royal Centre is that of the corridor leading to the southern gateway of the Ramachandra temple (Pl. 7.17), perhaps used by the king for entry into the royal chapel. The "king's path" has been rotated to the east by 1°30' to align with the *shikhara* of the Hanuman shrine. Standing at the exact center of the avenue at its southern end, the king would have seen the *shikharas* of the nearby Ramachandra temple and the distant Hanuman shrine separated by only 7'. The symbolism of the birthplace of Hanuman, devotee and guardian *par excellence*, superimposed upon the king's chapel is provocative.

A third line leads to Matanga hill. Precisely placed between Matanga and Anjenadri hills is Kotilinga-*tirtha*, consisting of a two *mandalas* carved into the bedrock on the bank of the Tungabhadra river. The larger *mandala* contains over 1,000 *lingas* (Pl. 7.18). As seen from Kotilinga-*tirtha*, the *shikharas* of the temples of these two hills are within 2' of 180° apart. On the adjacent bedrock there is a carving of Hanuman facing Anjenadri.

The fourth line leads to two sites that figured significantly in the life of Hanuman and Sugriva. Closest is Chintamani *ashram* where Rama shot Vali while he and Sugriva were fighting. Across the river is Vali Kasta, the ash pile that is identified with the cremation of Vali (Fig. 7).

Raghunatha

On the summit of Malyavanta hill is the Raghunatha temple and next to it there are 20 *lingas* and Nandis carved into the rock on either side of a crack which has an orientation of 74° 35'. The crack is known as Laksmana *bana* after an arrow shot by Laksmana (Pl. 7.19). A second crevice just south of the temple has a similar orientation. Raghunatha temple and the smaller Lakshmi temple open to azimuths of 72°12' and 72°30', respectively. Elsewhere in the urban core we have identified a number of small temples, shrines, and palaces that also have orientations of 72°-76°. The mountain may have acquired additional symbolic relevance by its association with the sun on the day of the zenith sun, a highly important event in many societies which lie, like Vijayanagara, between the tropics of Cancer and Capricorn.

The Zenith Sun

One of our original goals in undertaking a survey of the orientations of the smaller temples was to search for possible alignments to the sun rising on the days of summer or winter solstice. Many of these structures are high on elevated rocky outcrops of the urban core, with good views of the sun on the horizon. At the latitude of Vijayanagara, on a flat horizon, sunrises on those two days of summer and winter solstice occur at azimuths of 65.5° and 114.4°, respectively.

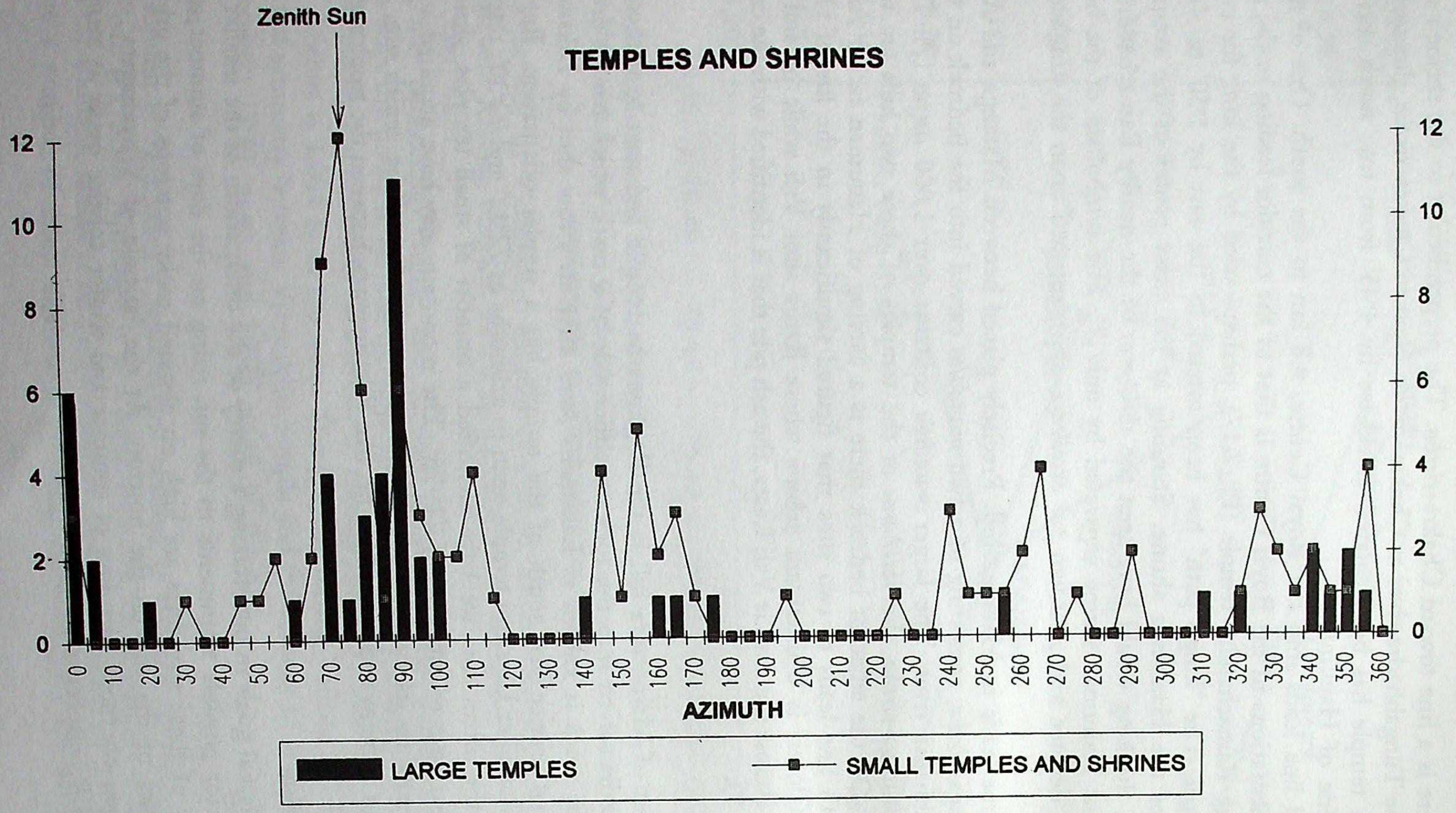


Fig. 7 Orientations of small temples and shrines in the urban core. Note the large temples are primarily aligned east-west while the small temples and shrines are aligned to the position of sunrise on the day of the zenith sun

Figure 8 gives the distribution of opening azimuths of small temples and shrines of the urban core that are inventoried in Michell (1990). It may be noted that the distribution of the major axes of these structures is in marked contrast to that of the large temples. Instead of a preference for east and north or for the solstices, the small temples primarily have azimuths of 70°-80°. The average orientation of the 35 structures in the north-east sector is 75.0°. The three other clusters are open to average azimuths of 159°, 257°, and 341°, and are approximately separated by 90° from each other. The average rotation away from cardinality for the four directions is 17°.

The 15°-17° rotation of the small temples, shrines, and palaces may identify the position of the rising sun on the morning when it crosses the zenith. At Vijayanagara, on the morning of May 3 and July 27, the sun reaches the zenith at noon. On those days, the rising sun on a flat horizon has an azimuth of 74°. When directly overhead, vertical structures cast no shadows. For numerous cultures living between the Tropics of Cancer and Capricorn, that day of the zenith sun is a major event (Aveni, 1981).

RUDRA AND SIRIUS

While the Vithala temple, one of the major temples in the Sacred Centre, has been constructed close to cardinal, its car street is rotated to a point on the horizon some 13° south of east. Along the street, the god of the temple was pulled in a ceremonial car at the times of certain festivals. The most straightforward geometry would have been for the car street to be an extension of the major east-west axis of the temple. Its 13° rotation has been something of a puzzle. If one visits Vithala during a January or February evening and walks in the dusk eastward along the wide car street, a bright star appears just along that street. It is the brightest star in the night sky, and especially when it lies low on the horizon it is a stunning object, constantly transforming shape and colour due to the rising air currents of the atmosphere. That star is Sirius, also known as Rudra-Shiva.

"Rudra in the sky is Sirius, star of stars, most exalted among them. In the morning dawn, before sunrise, when the red dawn-cows gather, Sirius is the 'fire-coloured boar of heaven,' impetuous, fiery, Rudra himself risen from the waters of the netherworld. At night, he is the silver-golden watchdog of the sky." (Kramrisch 1981: 44)

Hanuman, devotee of Rama and protector of the city, is also the *avatar* of fierce Rudra (Lutgendorf 1994). The connection between the Rudra, Hanuman, and Sirius may be expressed in the geometry of the Vithala car street. Rudra, sometimes visible at dusk, other times present at dawn, is the guardian and protector of the night. The same azimuth is repeated three more times in the city: the car streets of Virupaksha and Krishna temples, and the southern leg of the labyrinth of the Royal Centre.

CONCLUDING REMARKS

The task of documenting the cosmic geometries of Vijayanagara would have been far simpler had the city been placed on a featureless plain and built at one time according to a single plan. There is clear evidence for city planning in the symmetries of Vithala, Virupaksha,

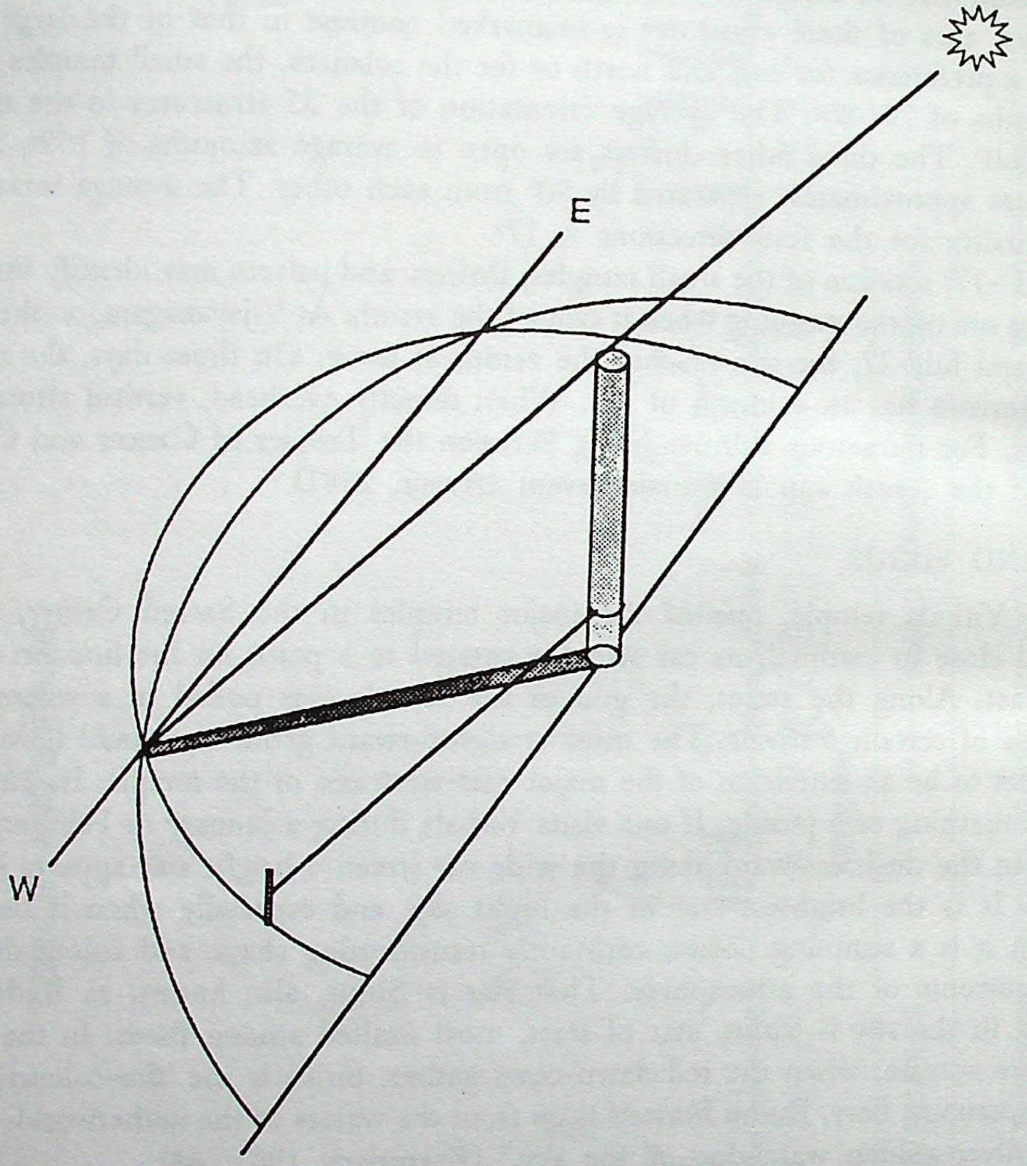


Fig. 8 Determination of east-west by means of shadow casting by a gnomon

and Prasanna Virupaksha temples. The signature of observational astronomy is certainly present in the accurate alignments of the north-south axis passing through Matanga hill and the Royal Centre.

The hills of the city have exerted the greatest influence upon its design through a variety of geometric strategies, some of which involve cosmic geometries that link the microcosm to the mesocosm. A number of these geometries are so straightforward that they are incontestable such as the rotation of the Ramachandra temple to Mātanga hill (Pl. 7.11), the location of Virupaksha temple in line with Virabhadra and Raghunatha temples (Fig. 6 & Pl. 7.12), and the locaiton of Kotilinga-*tirtha* exactly between Matanga and Anjenadri hills (Pl. 7.18). The most precisely established north-south meridian of the ancient, pre-telescopic world appears to pass through the Royal Centre of the city. Other geometries are more subtle such as the accurate symmetry of Virupaksha, Vithala, and Prasanna Virupaksha temples (Fig. 6) and the rotation of the entire Virupaksha-Matanga-Tiruvengalanatha complex toward Anjenadri hill (Fig. 5). The powerful roles of the birthplace of Hanuman on Anjenadri hill (Fig. 5) and of the zenith sun (Fig. 7) in organizing temples and shrines are remarkable but indisputable.

The precision with which certain geometries of the city have been established precludes accidental coincidences and points to the intentionality of kings, architects, and city planners. No longer can one view the temples, palaces, and shrines of Vijayanagara as a collection of independently conceived structures, with no overall meaning or continuity. The city is a true cosmos in which few, if any, of the major structures are isolated and unconnected. The primary figures in the mythological dramas of the area including Rama, Pampa, Virupaksha, and Hanuman, appear in striking and often surprising geometrical relationship. The Vijayanagara kings must have relished incorporating these geometrical metaphors into their city, linking their capital to the great events of history and prehistory.

APPENDIX: MEASUREMENT AS A CREATIVE ACT

The achievement of such extraordinary accuracy in locating the north-south axis of Vijayanagara results from two reinforcing themes in Indian architecture. Not only were techniques developed for precision measurements of the sun, but there was a robust religious support for such precision. The very act of measurement was understood to be a re-enactment of creation. Prajapati, who is the Year, measures the world, both in space and time, with his eye, the sun. Purusha, identified with Visvakarman, the architect of the universe, "bears the measuring rod (*mana*), knows divisions, and thinks himself composed of parts" (*Vayu-purana* IV.30-31: Kramrisch 1941:131).

Both Vishnu and Varuna use the sun as their scale with which to measure the earth (*Rigveda* VI.49.13; V.85.5). "What precedes the sun is timeless (*akala*) and undivided (*akala*); but what begins with the sun is Time that has divisions and its form is the year" (*Maitri Upanisad* VII.11.8). In its daily movement from dawn to sunset the sun measures the earth along its east-west path and establishes those two directions of space. At its highest point the sun establishes the north-south axis. On certain days of the year between the Tropics of Cancer and Capricorn, the sun reaches the zenith of the sky, thereby establishing fifth and sixth directions, zenith and anti-zenith. During its annual movement the sun moves eastward along the ecliptic approximately 1° per day, marking the days, the four seasons, as well as the dates when the sun emerges from the cosmic ocean (at vernal equinox) and sinks back into the cosmic ocean (at autumnal equinox).

To measure *ma* is to give existence to a thing, to give it reality in our world. *Maya*, or manifestation, refers to division of the original, undivided Whole, and is the illusory world created when Purusa performed division upon himself (Zimmer 1946).

Recognition of the role of measurement in cosmogony extends far back into the past time of India. The Vedic altar was reconstructed each year near the time of vernal equinox as a symbolic reconstruction of Prajapati, the year (Kramrisch 1981). Built of five layers, representing the five seasons and the five directions, the altar was surrounded by a wall of 360 bricks acknowledging that the year is bounded by 360 days. During the building of the wall 1,200 syllables were recited at the laying of each stone, resulting in a total of 432,000 syllables built into the wall (*Satapatha Brahmana* X.4.4.30). There are 432,000 syllables in the *Rigveda*, and 432,000 years in the *Kali Yuga*. The altar itself was constructed with 10,800 bricks corresponding to the number of hours in the year with 30 hour days (*Satapatha Brahmana* X.4.2.18).

The importance of precise orientation and measurement in construction of the temple reveals the cosmogonic symbolism involved in the act. The Sanskrit term referring to the temple, *vimana*, means "well-measured" or "well-proportioned". Texts on temple architecture give extensive discussions of the system of proportional measurements that should determine all features of the temple. The basic unit used in the *Ajitagama* and *Rauravagama* (Dagens 1984) is a "speck of dust" (*rajas*) as seen in a beam of light. The series of units extends upward through a hair end, nit, louse, to the barley grain which is 8^5 specks of dust in size. Other common units are the digit, *angula*, which may be 6, 7, or 8 barley grains and the cubit, which for the measurement of temples is 25 *angula* (Dagens 1984). Only if the temple was built with proper and precise units could it function effectively (Michell 1988).

The orientation of the site had to be established at the time when the sun was in the northern part of the sky, i.e. when it was above the cosmic ocean, on a day when there were no spots on its visible surface. A pillar, the gnomon, was erected and used to cast measured shadows. At one level of meaning that pillar represents the God Indra who "pillared apart" heaven and earth, supported the heaven and steadied the earth (Kramrisch 1991). "The building of every sacred shrine was a paradigmatic reiteration of the archetypal separation of heaven and earth" (Irwin 1991). Irwin (1981, 1983) has extensively discussed the symbolism of Asokan (and pre-Asokan) pillars with regard to pillar worship in India. The *yupa*, a sacrificial post, the *lingam*, the central pole of a tent used for dance, and the tree are other examples of sacred or ritual pillars. The stalk of the lotus bearing Brahma, the four-faced creator of the universe, is another cosmogonic pillar from which creation emanates.

In the gnomon we encounter the remarkable union of a technical device, used to determine true cardinality, with a powerful cosmogonic symbol. The gnomon should have a circumference at its base equal to its height, tapering to 1/3 this circumference at its top (*Ajitagama:* Dagens 1984). It is placed in a square area, which has to be "as smooth as a mirror," checked with a water level. Around the gnomon is traced a circle with a radius equal to the height of the gnomon. Two points are marked on the circle where the shadow of the gnomon touches it at mid-morning and mid-afternoon. These two points are joined by a straight line which is close to true east-west.

This method, often referred to as the Indian Circle method, produces an alignment to the true cardinal directions which is only approximately accurate during most of the year. Moving between its winter and southern extremes at the solstices, the sun changes declination most rapidly at the equinoxes. At the time of vernal equinox, for example, since the sun moves northward between mid-morning and mid-afternoon, the eastern point, produced by the afternoon shadow, is shifted slightly southward of the western point. The line connecting the two points would thus be tilted south of east in the spring and north of east in the fall.

Brahmagupta (born AD 598) is credited with the first recorded recognition of this defect of the method (Yano 1986), although he did not give a formula for correction. Apparently in 864 AD, Prithudakasvamin knew of the formula but did not succeed in versifying it in Sanskrit and hence was not given full credit. In the classical age of India, one could not claim priority for a scientific discovery unless one could express it in Sanskrit verse. Sripati (AD 1039) was the first who successfully versified the formula, and after him the formula apparently became common knowledge among Indian astronomers (Yano 1986):

$$s = h\ [\sin(\text{dec}_1) - \sin(\text{dec}_2)]\ /\ \sin(\text{co-latitude})$$

where s is the distance of the tip of the shadow from the east-west line, h is the hypotenuse of the shadow, and dec_1 and dec_2 are the respective declinations of the sun at the time in the morning and afternoon when the shadows touch the circle.

Even on the days of equinox, the effects of the movement of the sun in declination are quite slight. During 6 hours from mid-morning to mid-afternoon, the declination of the sun varies at most by 6 minutes of arc. On the ground beneath the gnomon the error would amount to 2.6 cm for a 10-metre tall pole at a latitude of 20° on the day of equinox.

The amount by which the sun changes its declination during the day decreases as the sun moves away from equinox, and at solstice the change is zero. For the two-month period around solstice, the maximum error is only 3' and within 10 days of solstice, the maximum error has fallen to 1', and the correction formula is hardly needed.

A second method of correcting the gnomon technique involved drawing three concentric circles around the base of the gnomon (*Mahabhaskariya* II, 2; *Agitigama* IX, 8). This method did not require the equation of Sripati, nor knowledge of the declination of the sun or the latitude of the site. At equinox the lines connecting the three pairs of point could differ from true east-west by 9', 6', and 3' and the trend of these deviations could be used to correct any one of the lines.

A third approach was to measure the shadow length on two successive days at the same time in the morning (*Manusyalayacandrika* II, 3-4). The position of the afternoon shadow on the first day was corrected by 1/3 the difference of the morning positions.

Measurements with a gnomon could have been limited to periods around the solstices when the method yielded accurate cardinality, but additional considerations such as auspicious dates for the patron may have demanded dates closer to equinox. The vernal equinox, itself, was a significant time when the sun moved from the lower celestial waters to the more auspicious upper waters. Since the sun rises due east at equinox, that date may also have seemed most appropriate for laying out the ground plan of the temple which faces east.

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GLOSSARY

aditya	Aspects of the sun.
arati	The circling of oil lamps before the image of the deity.
argha	The respectful offering of water, rice, or flowers to a god; *surya argha,* offering of water to the sun at dawn.
aruna	Ruddy as the colour of dawn; Aruna, the charioteer of the sun.
ashrama	A stage of life, traditionally four: student, householder, forest-dweller, and renouncer.
ashvamedha	Vedic horse sacrifice; *Dashashvamedha*: ten horse sacrifices, which is the name of one of the *ghats.*
Avimukta	The "Never-Forsaken", a name of Banaras.
Bakaria/Bakri	Name of Krishna
bhakti	"Devotion, honour, love"; from *bhaj* meaning to share, to be devoted, to love. The heart's attitude of devotion and love towards God.
brahmin	The priestly class.
Brahmanas	Priestly compositions appended to each of the four Vedas, 900-700 BC.
Daksha	The father of Sati, the first wife of Shiva, who insulted him by failing to invite his son-in-law to a great sacrifice; Sati immolated herself and Shiva destroyed the sacrifice.
darshana	The auspicious viewing of a deity.
gana	The "group, troupe" of demi-gods who are attendants of Lord Shiva.
Ganga	Sacred river of north India.
garbha griha	Inner Sanctum; womb chamber
ghat	The bank of a river or coast.
Gupta	Major dynasty of northern India, AD 320-455.
Garuda	The 'devourer', enemy of serpents, the sun bird upon whom Vishnu rides.

Jnanavapi	The Well of Knowledge, adjacent to Vishavnatha temple at the centre of today's Varanasi.
Kashi	The shining, luminous city; the city of light.
Kashi Khanda	Section of the *Skanda Purana*.
Keshava	A name of Krishna.
kha	The sun; a cavity such as space; the sky.
khandas	A section of land (as in *Kedara Khanda*) or of a literary work (as in *Kashi Khanda,* lengthy section of the *Skanda Purana*).
Krishna	The god and adviser in the *Mahabharata*.
kshetra	Field or area of land. In the case of Kashi *kshetra*, the "sacred zone" of Kashi.
Kunda	A pool or well, often used for bathing.
linga	The emblem of Shiva.
Madhyameshvara	The centre of ancient Kashi.
Mahabharata	Together with the *Ramayana*, one of the great epics of Hinduism; 300 BC – AD 300.
mahatmya	Praise literature.
makara samkranti	The occasion for date of the entry of the sun into the constellation of Makaram.
Makaram	Capricorn.
mandala	The diagram consisting of a triangle, a square and/or circle that is a map of the cosmos.
mantra	A sacred formula or prayer.
Marichi	Vedic symbol for particle of light.
Marici	Buddhist goddess with seven pigs.
nagas	The ancient serpent deities of India.
mela	A festival.
Panchakroshi	The circular pilgrimage route around Kashi, taking five days, and covering five *kroshas* (ten miles).
Pandavas	Five brothers in the *Mahabharata*.
Parvati	Wife of Shiva.
pradakshina	Circumambulation; honouring something holy by walking around it, keeping it to one's right.
Prajapati	The lord of the creatures, an epithet of primeval creators; the constellation of Orion, associated in the sky with his daughter Rohini (Aldebaran).
pralaya	The destruction of the earth and cosmos after each *kalpa*, the day of Brahma.

puja	Act of worship.
Puranas	A collection of post-Vedic mythologies
Rahu	The 'seizer'; the demon who was decapitated by Vishnu when discovered drinking *amrita*, the elixir of life, after the churning of the cosmic ocean; the ascending node of the sun; one of the two dark planets which are responsible for solar and lunar eclipses.
Rig Veda	Collection of hymns, originating before the twelfth century BC.
rita	Fundamental law of the universe; represented by the *adityas* and manifested by the visible sun.
Samba	Son of Krishna.
sandhya	Morning ritual; 'juncture', the time between night and sunrise.
shastras	A sacred treatise or body of learning, such as the *Dharmashastra*, the "Teachings about Dharma".
shikhara	The spire of a temple, literally the "peak". Also the word for mountain peak.
Shiva	The 'auspicious' god of ascetics, both creator and destroyer.
stupa	A Buddhist monument, shaped like a dome, where the earthly relics of the Buddha were honoured.
Surya	Sun god.
tirtha	Ford of a river; crossing place between worlds; pilgrimage site.
Varanasi	Kashi, Banaras; the city between the Varana and Asi rivers.
varna	The four classes of Hindu society: *brahmin, kshatriya, vaishya, shudra.*
Veda	The sacred literature of Hinduism.
uttara	Upper, superior, northern direction.
yatra	Pilgrimage.
yuga	The "ages" of the world, four in number: *krita, treta, dvapara,* and *kali;* the first being the perfect age of the beginnings, the last being this age of strife, the Kali Age.

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